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Determination of Near Infrared Spectra

Rocket Exhaust Corrosion Simulator

Methods of Determining Surface Roughness

Ultrathermic Capacitors

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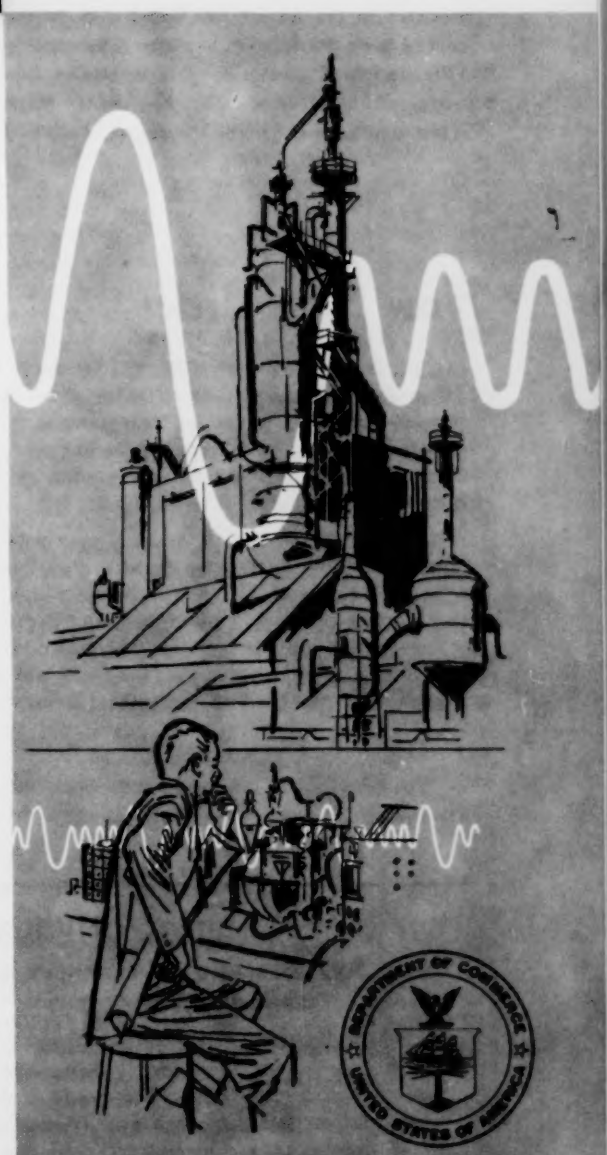

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U. S. DEPARTMENT OF COMMERCE

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U.S. Government RESEARCH REPORTS

Vol. 31, No. 3 Pp. 123-182 March 13, 1959

BEHAVIORAL SCIENCES

Aviation Psychology Lab., Ohio State U. Research Foundation, Columbus.
AN INVESTIGATION OF THE PERFORMANCE OF THE HUMAN MONITOR, by Daniel Howland. Rept. on Contract AF 33(616)43. July 58, 15p. 10 refs.
WADC Technical note 57-431; AD-142 259.
Order from OTS $0.75 PB 151 329

Two groups of 12 subjects each were required to monitor for a continuous 4-hr, period four voltmeters which presented readings that were randomly assigned from a normal distribution with a mean of 12 v. and a standard deviation of 2 v. Subjects were instructed to note shifts in the mean of each voltmeter reading. One group kept a written log of the voltmeter readings; the other group kept no records. Experimental data included number of correct reports of shift of the mean, number of false reports of shift, and time taken to report a change in the mean. Results indicate that subjects who kept a log made fewer false reports of shift, more often failed to report a true shift in the mean, and took more time when they did report a true shift. The difference in performance between subjects who kept a log and those who did not increased during the last 2 hr. of the observation period.

Personnel and Training

Air Force Personnel and Training Research Center, Lackland AFB, Tex.
RESEARCH ON METHODS OF EVALUATING MAINTENANCE PROFICIENCY, by Herbert W. Gustafson. Jan 58, 15p. AFPTRC TR-58-6; AD-152 108.
Order from LC mi $2.40, ph $3.30 PB 134 380

Four separate research efforts were devoted to developing improved performance-testing techniques: (1) preparation of a guidebook on maintenance-performance evaluation; (2) statistical re-analyses of proficiency test data to relate troubleshooting performance to specific kinds of aptitudes and basic knowledge, and to determine the relations among types of errors committed in performing complex alignments and adjustments; (3) development of two microfilm projection devices for use in training troubleshooters and in assessing troubleshooting performance; and (4) a study of the effects of variations in performance-testing procedures. Two studies of maintenance performance records are also reported.

Air Force Personnel and Training Research Center, Lackland AFB, Tex.
REVIEW OF RESEARCH IN TYPEWRITING LEARNING WITH RECOMMENDATIONS FOR TRAINING, by Leonard J. West. June 57, 115p. 213 refs.
AFPTRC TN-57-69; AD-126 400.
Order from LC mi $6.00, ph $18.30 PB 135 925

The large demand for trained typists by the Air Force and by other military, governmental, and civilian agencies imposes a requirement for up-to-date guidance on the design of courses of instruction in typewriting. The relevant research evidence is, for the most part, not readily accessible. It has never been critically evaluated in the light of current psychological knowledge in order to assess its implications for typewriting training. To meet these needs, such a review and evaluation was prepared as a basis for potential improvements in typewriting instruction and in later job performance. The review covers the research in typewriting from the earliest known studies through mid-1956. Assessment of the research in typewriting in the light of the body of psychological knowledge about learning has allowed the identification of preferred instructional practices. These, and the research evidence behind them, are reported in twelve sections: (1) the nature of the typing learning process, (2) technique aspects of typing learning, (3) learning the typewriter keyboard, (4) developing typing speed, (5) accuracy development, (6) speed versus accuracy

emphases, (7) miscellanesous instructional procedures and materials, (8) equipment factors and the working environment, (9) practice time arrangements, fatigue, and other motivational factors, (10) typical progress in typing learning, (11) testing, grading, and standards of achievement, (12) summary of recommendations for training.

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
AN EVALUATION OF THE PSYCHOLOGICAL PROBLEM OF CREW SELECTION RELATIVE TO THE SPECIAL HAZARDS OF IRRADIATION EXPOSURE. 22 July 49, 55p. NEPA-1110-IER-20; AD-146 563.
Order from LC mi $3.60, ph $9.30 PB 135 670

Proceedings of the NEPA Medical Advisory Panel Sub-Committee no. 9.

Ohio State U. Research Foundation, Columbus.
INTERNATIONAL LANGUAGE FOR AVIATION, by Henry M. Moser, Thomas W. Kirkconnell and Susan M. Wolfe. Interim rept. on Contract AF 19 (604)1577. Apr 58, 19p. Technical rept. 46; AFCRC TN-57-63; AD-146 776.
Order from LC mi $2.40, ph $3.30 PB 135 212

The material in this report, which incorporates suggestions made by the Speech Panel, has been revised to present a logical base for the standardization of present and future ILA. The aim has been to discover the fundamental principles used in radiotelephone communication, and to establish rules which will facilitate teaching and which can be followed to formulate phraseologies that have not been determined.

Psychological Services, Inc. [Los Angeles, Calif.]
DEVELOPMENT AND EVALUATION OF A TROUBLESHOOTING AID FOR FLIGHT-LINE MAINTENANCE OF A COMPLEX ELECTRONIC SYSTEM, by Neil D. Warren, Robert S. French and others. Rept. on Contract AF 41(657)44. Jan 58, 35p. (In cooperation with Sperry Rand Corp.) AFPTRC TN-58-1; AD-152 110.
Order from LC mi $3.00, ph $6.30 PB 135 569

A study was conducted to determine whether an effective and logical troubleshooting aid for complex electronic systems could be developed for use by relatively inexperienced flight-line mechanics. The feasibility of such an aid was investigated for the K Bombing-Navigational System. A Trouble Locator in booklet format was developed and evaluated. A "procedure-oriented" approach to identify malfunctioning loops supplemented by a "sympton-oriented" approach for within-the-loop troubleshooting was found to be desirable; both procedures were incorporated in the final Trouble Locator.

Psychology

Air Force Personnel and Training Research Center, Lackland AFB, Tex.
INTERACTION OF EXPERIENCE AND APTITUDE IN PREDICTING SUCCESS IN TRAINING COURSES FOR AIRPLANE AND ENGINE MECHANICS, by Mary Agnes Gordon. Research rept. Nov 57, 17p. AFPTRC TN-57-133; AD-146 406.
Order from LC mi $2.40, ph $3.30 PB 135 580

The studies in this report explore the nature of regional differences in background, the influence of background factors on the prediction of mechanical training grades, and the effect of different backgrounds at various stages in training. Differences in background may be measured either by biographical information or by the difference between comprehension and information scores on mechanical aptitude tests.

American Inst. for Research, Pittsburgh, Pa.
PREDICTION OF AIRMAN REENLISTMENT, by Robert Fitzpatrick and John W. Cullen. Technical rept. on Contract AF 41(657)12. Dec 57, 14p. AFPTRC TR-57-12; AD-146 416.
Order from LC mi $2.40, ph $3.30 PB 135 582

This study was designed to develop psychological measures to provide more accurate prediction of reenlistment vs. non-reenlistment of airmen. Interviews were used in the first phase to explore the motivation, attitudes, and personality characteristics that differentiate reenlistees from non-reenlistees. In the second phase written tests were developed to measure these characteristics, and these new tests as well as some older ones were validated against final decision regarding reenlistment. The composite for predicting should probably take into account the career field for which the man is qualified. Further study is needed to validate the test battery on incoming airmen.

Human Engineering Lab., Aberdeen Proving Ground, Aberdeen, Md.
SOME EFFECTS OF NOISE ON HUMAN BEHAVIOR, by Nathan H. Azrin. June 58, 25p. 29 refs. Technical memo. 6-58.
Order from LC mi $2.70, ph $4.80 PB 135 349

Military personnel were conditioned according to a fixed-interval schedule of target presentation and exposed to various conditions of noise. It was found that the effects of noise on behavior was largely a function of whether the noise had any differential relation to the target or to the response. When noise, or its absence, was used as a discriminative stimulus for the target, responding came under the control of the noise, or its absence. Similarly, when intense noise, or its absence, was made contingent upon responses, the pattern and frequency of responding was found to vary as a function of the conditions of noise presentation. When the noise was not presented in some differential relation to

the target or the responses, its major effects were transient and largely predictable on the basis of stimulus change.

Institute for Research in Human Relations, Philadelphia, Pa.
DEVELOPMENT OF A JOB SAMPLE TROUBLE-SHOOTING EXAMINATION, by John Jensen, Harry Hill and others. Progress rept. on Contract N8onr-694(02). 15 Jan 54, 37p. Series 1954, inst. rept. no. 1; AD-26 472.
Order from LC mi $3.00, ph $6.30 PB 135 387

An aviation electricians (AE) job sample trouble-shooting examination was constructed in 4 parts corresponding to the 4 steps necessary to locate by system analysis and remedy the cause of electrical discrepancies. This project also developed and pretested a pool of over 600 items which may form the basis for the AE written examination, the purpose of which is to predict a troubleshooting criterion. These items were administered to 399 aviation electricians. The results from this test administration were analyzed and the pool was reduced to 351 items to be considered for validation against the job sample troubleshooting criterion.

Michigan U., Ann Arbor.
ATTITUDE CHANGE AS RELATED TO PERCEIVED MAJORITY OPINION, by Martha Sturm White. Rept. on Contract AF 33(038)26646. June 57, 45p. 16 refs. AFPTRC TN-57-79. AD-131 431.
Order from LC mi $3.30, ph $7.80 PB 135 514

Results for the three critical items indicated that subjects whose perception of the group consensus changed most, changed more in individual attitudes and more toward conformity with the majority. Individual tolerance for nonconformity was a factor in susceptibility to influence attempts, but acceptance of the class as a reference group had less effect than had been expected. This seemed to be due to the fact that reference groups with differing opinions had not been taken into account sufficiently The data suggest that if an individual has strongly opposing reference groups, a change in his attitude is less likely to occur. Less conformity change also tended to occur on those items judged most important to the group, and in individuals who felt intensely about an item.

Personnel Lab., Lackland AFB, Tex.
STABILITY OF PERSONALITY TRAIT RATING FACTORS OBTAINED UNDER DIVERSE CONDITIONS, by Ernest C. Tupes and Raymond C. Christal. May 58, 19p. WADC Technical note 58-61; AD-151 041.
Order from LC mi $2.40, ph $3.30 PB 135 129

Peer ratings by officer candidates on specific personality traits have been shown to be predictive of later officer performance. The present study investigated personality trait ratings to determine their factorial structure and the extent to which the factors remained constant in spite of differences in samples, raters, lengths of acquaintanceship, and rating situation. Five clearly defined personality factors found in each analysis which remained relatively invariant through all analyses were identified as Surgency, Agreeableness, Dependability, Emotional Stability, and Culture.

Psychological Lab., U. of Southern California, Los Angeles.
REVISED STRUCTURE OF INTELLECT: STUDIES OF APTITUDES OF HIGH-LEVEL PERSONNEL, by J.P. Guilford. Rept. on Contract N6onr-238(10). Apr 57, 26p. Rept. no. 19.
Order from LC mi $2.70, ph $4.80 PB 134 355

School of Aviation Medicine, Randolph AFB, Tex.
ADAPTABILITY SCREENING OF FLYING PERSONNEL. RESEARCH ON THE INDIVIDUAL TEST BATTERY, by Richard M. Ritter. Apr 58, 13p. 16 refs. Rept. 58-52.
Order from LC mi $2.40, ph $3.30 PB 135 060

This study examined the relationships of 41 experimental variables, derived from five psychologic tests, with appropriate specific and pooled criteria in separate samples of Air Force aviation cadets. The tests, which were administered individually involved habit interference in printing symbols, mirror vision drawing, color naming, and different aspects of complex perceptual-motor behavior. The findings indicated that the Controls Orientation Test (CP 638A), and apparatus designed to elicit "controls confusion," warrants further investigation as a potentially useful device for adaptability screening.

School of Aviation Medicine, Randolph AFB, Tex.
EXPECTATION OF FOOD REWARD AS THE REINFORCING AGENT IN A LEARNING SITUATION, by Claude B. Elam. Apr 58, 7p. 14 refs. Rept. 56-133.
Order from LC mi $1.80, ph $1.80 PB 135 066

An experiment involving comparison of two non-primary reinforcement learning situations was performed. One group of rats received a relatively greater number of stimulus cues than did a second group, but learning was retarded among the first group. The results are interpreted as being contradictory to the concept that incidental stimuli can acquire reinforcing properties and as being favorable to an expectancy theory. Helson's theory of adaptation level is the theoretic model employed in explaining these and other results.

Teachers Coll., Columbia U., New York.
THE OPTIMUM TEST COMPOSITES TO PREDICT A SET OF CRITERIA, by Robert L. Thorndike. Research rept. on Contract AF 18(600)1208. July 57, 23p. AFPTRC TN-57-103; AD-134 224.
Order from LC mi $2.70, ph $4.80 PB 135 518

A technique developed by Ledyard Tucker was applied to the intercorrelations of the Airman Classification Battery AC-1B and to validity coefficients for the test in this battery for 46 training schools. The technique involves a series of matrix transformations, and yields a set of orthogonal composites of the original test scores such that the first composite accounts for the maximum amount of predictable criterion variance, and each following one accounts for the maximum amount of residual predictable criterion variance. The technique used appears to provide a useful analysis of test validities. In planning future aptitude indexes for selection and classification, the nature of the four composites resulting from the present analysis and the validity of each for each job might advantageously be considered.

BIOLOGICAL SCIENCES

Radiobiological Lab., U. of Texas, Austin.
EVIDENCE OF HEMATOLOGIC RECOVERY FROM HYPERVITAMINOSIS D IN THE MONKEY, by George S. Melville, Jr., Quentin L. Hartwign and others. Apr 58, 11p. 9 refs. AFSAM rept. 58-57.
Order from LC mi $2.40, ph $3.30 PB 135 058

The peripheral blood picture of 30 male Macaca mulatta monkeys has been studied 12 to 16 months following an acute vitamin D intoxication. Hematologic values were compared with the normal ranges published in the literature and with normal values taken in monkeys in this laboratory prior to the hypervitaminosis D. An analysis of variance was performed to assess the effect of frequent blood aspiration on peripheral blood values. A comparison with similar results taken in monkeys before the episode showed that the responses to experimental bleeding were equivalent. The clinical picture of these animals is one of excellent health. By two criteria, then, the animals in this study--survivors of acute vitamin D poisoning--are essentially hematologically normal.

School of Aviation Medicine, Randolph AFB, Tex.
FRACTIONAL ANALYSIS OF WOUND FLUID. Further studies, by Gordon F. Vawter. Mar 58, 6p. 7 refs. Rept. 58-38.
Order from LC mi $1.80, ph $1.80 PB 135 064

Chemical and histochemical estimates of lipids and sulfhydryl material were performed on nonclotting fluid and at the sites of tissue reaction in guinea pigs at 3 days and at 10 days after subcutaneous implantation of wire mesh capsules. Several characteristics of these materials are described. Bacterial contamination of the wound was commonly demonstrated. At 3 and 10 days, plasma was shown to have increased quantities of lipoproteins of both high and low density; in the wound fluid, only Sf_{0-12} lipoproteins were consistently present-particularly after 10 days. A concentration gradient of sulfhydryl between plasma and the soluble phase of wound aspirate was not proved. Little sulfhydryl was shown to exist as free amino acid in the latter. Ratios of sulfhydryl to total protein were higher in wound fluid than in plasma.

Anatomy and Physiology

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
HUMAN TOLERANCE TO PROLONGED FORWARD AND BACKWARD ACCELERATION, by Neville P. Clarke and Stuart Bondurant. Rept. on Biophysics of Space Flight. July 58, 29p. 30 refs. WADC Technical rept. 58-267; AD-155 749.
Order from OTS $1.00 PB 151 422

Optimal body positions for forward and backward acceleration are defined. Plateaus between 2 and 12 g were maintained with optimal positioning, until subjective loss of a critical faculty occurred. Forward acceleration of the seated subject with trunk inclined 25° in the direction of acceleration was limited above 10 g by blackout and below 10 g by inspiratory dyspnea and substernal pain. Using an especially designed restraint suit, backward acceleration of the seated subject with trunk and head erect was limited above 10 g by discomfort of restraint and increases in vascular pressure in the legs, and below 10 g, by these factors as well as dyspnea. Three-stage rocket-like profiles of forward acceleration, calculated to give orbital velocity, were found tolerable by selected subjects at peak accelerations of 8, 10, and 12 g.

Air Force Missile Development Center, Holloman AFB, N. Mex.
EXPERIMENTS CONDUCTED ON A SWING DEVICE FOR DETERMINING HUMAN TOLERANCE TO LAP BELT TYPE DECELERATIONS, by Sidney T. Lewis and John P. Stapp. Dec 57, 22p. 3 refs. AFMDC TN-57-1; AD-135 005.
Order from LC mi $2.70, ph $4.80 PB 135 420

Anthropomorphic dummies and human volunteer subjects were decelerated while seated in swing-seat device, facing forward and being restrained by lap belts three inches wide. The swing consisted of an aircraft seat, suspended by cables forming a swing-pendulum, which could be raised and dropped through a measured vertical component and arrested by a steel cable. Rate of onset, magnitude, and duration are tabulated for 21 dummy tests and 19 human tests.

Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
PERCEPTRON, A THEORY OF STATISTICAL SEPARABILITY IN COGNITIVE SYSTEMS, by Frank Rosenblatt. Final rept. on Proj. Para, Contract Nonr-2381(00). Jan 58, 261p. 23 refs. Rept. no. VG-1196-G-1.
Order from OTS $4.00 PB 151 247

The theory of statistical separability and the design of the perceptron, which are presented in this report, originated from a series of studies of memory trace mechanisms in the central nervous system. Before 1950 little was known about the mechanisms involved, but certain general physiological observations seemed to be clearly established, particularly the finding that memory traces could not be clearly "localized" to a few particular cells, but appeared to be distributed throughout the tissue of the association system, so that partial extirpation would have little effect. At the same time, despite the dearth of empirical evidence, a number of theoretical models of possible memory systems had been proposed. No one of these had proven adequate to account for the vast bulk of storage and the speed and flexibility of associative recall in the human nervous system. All of the mathematically precise, logical models which had been proposed to date were systems in which the phenomenon of distributed memory, or "equipotentiality", which seemed so characteristic of all biological systems, was either totally absent, or present only as nonessential artifact, due to postulated "repetitions" of an otherwise self-contained functional network, which, by itself, would be logically sufficient to perform the functions of memory and recall.

Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
TWO THEOREMS OF STATISTICAL SEPARABILITY IN THE PERCEPTRON, by Frank Rosenblatt. Rept. on Proj. Para, Contract Nonr-2381(00). Sep 58, 45p. 4 refs. Rept. no. VG-1196-G-2.
Order from OTS $1.25 PB 151 247(suppl.)

Contents:
Probabilistic mathematics vs. symbolic logic
The importance of perceptual processes for automata
The continuous transducer neuron
Organization of a perceptron
Some important correlation coefficients
The theory of class C perceptrons
The class C' theorem
Significance of the class C' perceptron

School of Aviation Medicine, Randolph AFB, Tex.
HEARING ACUITY OF AIR FORCE RECUITS, by Max H. O'Connell. Apr 58, 5p. 3 refs. Rept. no. 58-70.
Order from LC mi $1.80, ph $1.80 PB 135 055

The hearing testing facility for all Air Force recruits beginning training at Lackland Air Force Base is described, including the demountable sound-treated test booths, Rudmose automatic audiometers, and general testing schedules and procedures. Hearing levels are expressed by (1) age groups for the frequencies tested, and (2) classification of hearing acuity by classes A, B, and C by right, left, and worse ears.

Biochemistry

School of Aviation Medicine, Randolph AFB, Tex.
EFFECT OF BETA-SITOSTEROL ON SERUM CHOLESTEROL AND LIPOPROTEIN LEVELS OF PATIENTS INGESTING A LOW-FAT DIET, by Norman Weiner, Weldon L. Walker, and Lawrence J. Milch. May 58, 6p. 17 refs. Rept. 58-55.
Order from LC mi $1.80, ph $1.80 PB 135 059

Twenty-one male patients with overt atherosclerosis, whose weight had been reduced to "lean" levels and who were ingesting a low-fat diet, were given beta-sitosterol in a double-blind study. The drug was given over an 8-week period, and was either preceded or followed by a similar period of placebo administration. Though there was considerable individual variation in response to the drug, beta-sitosterol administration did result in significant reductions in mean levels of serum lipoproteins of the S_f 0-12 and S_f 12-20 classes. Changes in S_f 20-400 lipoprotein and serum cholesterol levels were not significant. The similarity of these blood lipid responses with those occurring while the patients were on a low-fat diet regimen indicates similar mechanisms may be operative, and that these means of reducing blood lipid levels may be, to some extent, additive. No toxic effects were observed from the daily oral dose of 10 gm. of beta-sitosterol over the 8-week period. The results indicate that beta-sitosterol has a definite effect in further lowering of at least some species of serum beta-lipoprotein in patients whose lipid levels have already been reduced by dietary means.

School of Aviation Medicine, Randolph AFB, Tex.
INEXPENSIVE CONTINUOUS PAPER ELECTROPHORESIS APPARATUS, by William G. Glenn and Heinz A. Jaeger. Nov 57, 6p. 7 refs. Rept. no. 58-2.
Order from LC mi $1.80, ph $1.80 PB 135 605

An inexpensive Plexiglas continuous paper electrophoresis apparatus is described. Both the buffer and ampholyte flow depend on capillary action and gravity. Details of the construction and operation of the equipment and accessories are included.

General Biology

American Physiological Society, Washington, D.C.
REPORT OF PRESENT TRENDS IN PHYSIOLOGICAL AND BIOLOGICAL RESEARCH AS REPORTED AT THE XXth INTERNATIONAL PHYSIOLOGICAL CONGRESS. Nov 56, 39p. AD-119 051.
Order from LC mi $3.00, ph $6.30 PB 135 857

In order to give as direct a picture as possible of the present trends in the various fields of interest of those attending, several of their individual reports (extracted and edited) are included to make up the body of this report. The name and position of each individual is given at the beginning of the

excerpts from his report. General areas of interest are indicated for easy reference.

New York U. Coll. of Engineering, N.Y.
STUDY OF METHODS FOR OBTAINING OXYGEN FROM CARBON DIOXIDE, by Henry J. Masson. Progress rept. on The Engineering Biotechnology of Handling Wastes Resulting from a Closed Ecological System, Contract AF 18(603)71. June 57, 18p. 40 refs. AFOSR TN-57-379; AD-132 453.
Order from LC mi $2.40, ph $3.30 PB 135 556

A means is being investigated for treating CO_2 to recover the O and convert C to a useful form or compound. One of the most important reactions in nature is $CO_2 + H_2O \xrightarrow{\text{catalyst}} (C_6H_{10}O_5)n + O_2 + Q$; chlorophyll is the catalyst in plants. Consideration is given to artificial photosynthesis, the decomposition of CO_2 to provide O, and the reactions of CO_2 with other substances.

Medical Specialties and Equipment

Cornell U. Medical Coll., New York.
HIGH SENSITIVITY DC AMPLIFIER FOR BIOLOGICAL MEASUREMENTS, by Albert Thalhamer. Technical rept. no. 8 on Contract N6onr-264(10). 15 Feb 53, 73p. AD-11 376. (In cooperation with Cornell U. School of Electrical Engineering)
Order from LC mi $4.50, ph $12.30 PB 135 396

The amplifier consists of push-pull stages from input to output circuits and provides for measurements in the range from 10 μv to 100 mv with 5 sensitivity positions. It is designed for use with auxiliary measuring or recording equipment having internal amplifiers. A detailed circuit description and operating instructions are included.

School of Aviation Medicine, Randolph AFB, Tex.
SALIVARY SODIUM, POTASSIUM, AND CHLORIDE LEVELS IN SUBJECTS CLASSIFIED AS TO DENTAL CARIES EXPERIENCE, by Ira L. Shannon. Apr 58, 7p. 19 refs. Rept. 58-74.
Order from LC mi $1.80, ph $1.80 PB 135 067

Whole saliva samples were collected from 537 selected male subjects between 17 and 23 years of age. Subjects were classified as to caries experience, past and present, and divided into "carious," "resistant," and "restored" categories. Subjects showing periodontal involvement to any degree were excluded. Volume and sodium, potassium, and chloride levels were determined and the data analyzed for differences between the three groups of subjects. Significant differences were noted in chloride and sodium findings for certain of the experimental groups.

Microbiology

Lovell Chemical Co., Watertown, Mass.
MECHANISMS OF MEMBRANE PREPARATION AND MEMBRANE ASSAYS, by Roger G. Pinette. Final rept. for the year ending 31 May 54. June 54, 52p.
Order from LC mi $3.60, ph $9.30 PB 136 556

Membranes of graded porosities (50 and 100 mu, 5, 10, and 20 u) can be produced from commercially available cellulose ester polymers. Cellulose acetate butyrate esters are unsatisfactory. The higher substituted cellulose acetate esters are suitable for fine membranes. The highly titrated types are susceptible to heat and yield brittle membranes. Low viscosities yield poor film strength. Acetone is an appropriate solvent, but improved cellulose dispersion is achieved by use of cosolvents during aging. A tentative formulation is given for a fine porosity membrane which retains more than 90% of T-5 phage particles. Quantitative phage retention assay procedures are described, along with a tentative method for assaying coarse filters. Nylon membranes show possibilities for relatively fine filters. The film described is stronger than cellulose membranes and has good hydrophilic characteristics.

Lovell Chemical Co., Watertown, Mass.
MONTHLY PROGRESS REPORTS OF RESEARCH CARRIED OUT, 1 JUNE 53-27 APRIL 54, by Roger F. Pinette. 11 nos.
Order separate reports listed below from LC by number and price.

Monthly progress rept. no. 1, 1-25 June 53, 14p. mi $2.40, ph $3.30, PB 136 545
Monthly progress rept. no. 2, 26 Jun-24 July 53, 17p. mi $2.40, ph $3.30, PB 136 546
Monthly progress rept. no. 3, 25 July-21 Aug 53, 16p. mi $2.40, ph $3.30, PB 136 547
Monthly progress rept. no. 4, 22 Aug-25 Sep 53, 16p. mi $2.40, ph $3.30, PB 136 548
Monthly progress rept. no. 5, 26 Sep-24 Oct 53, 21p. mi $2.70, ph $4.80, PB 136 549
Monthly progress rept. no. 6, 25 Oct-25 Nov 53, 11p. mi $2.40, ph $3.30, PB 136 550
Monthly progress rept. no. 7, 26 Nov-26 Dec 53, 9p. mi $1.80, ph $1.80, PB 136 551
Monthly progress rept. no. 8, 27 Dec 53-25 Jan 54, 10p. mi $1.80, ph $1.80, PB 136 552
Monthly progress rept. no. 9, 26 Jan-24 Feb 54, 17p. mi $2.40, ph $3.30, PB 136 553
Monthly progress rept. no. 10, 25 Feb-26 Mar 54, 13p. mi $2.40, ph $3.30, PB 136 554
Monthly progress rept. no. 11, 27 Mar-27 Apr 54, 21p. mi $2.70, ph $4.80, PB 136 555
(See also PB 136 556)

Pennsylvania State [U., University Park] Pa.
BASIC STUDY OF THE PHYSICS OF AEROSOL FORMATION, by W.G. Cutler and W.E. Meyer. Final rept. July 53, 236p.
Order from LC mi $10.20, ph $36.30 PB 136 543

All previous reports in the project are summarized

but descriptive data and experimental techniques are only briefly covered. Problems and theories on aerosol formation are reviewed. Several specific types of atomization processes are treated by dimensional analysis. A statistical approach is often used in the several approaches analyzed in the research itself. Conformal mapping has been used as well as photographic approaches for spray studies. Sources of spray data are tabulated. Surface tension and its role in the atomization of jets is discussed and the application of ultrasonics to aerosols is outlined.

Radiobiology

Radiobiological Lab., U. of Texas, Austin.
COMPARISON OF NORMAL AND IRRADIATED MONKEYS ON AN ODDITY-REVERSAL PROBLEM, by A.A. McDowell and W. Lynn Brown. Apr 58, 5p. 12 refs. AFSAM rept. no. 58-73.
Order from LC mi $1.80, ph $1.80 PB 135 056

Normal, low-dose irradiated, and high-dose irradiated monkeys were tested on an oddity-reversal problem which used the same stimulus cues in antagonistic response patterns. Originally, each animal was tested 24 trials a day to the criterion of two successive days with two errors or fewer a day on response to the object which was odd in color. In reversal training, each animal was tested to the same criterion on response to the object which was odd in form. Among the groups, no consistent differences were observed in the number of errors made made in reaching either the pre- or postreversal criterion. All groups showed a statistically significant increase in errors to criterion on reversal learning over errors to criterion on original learning. There was a statistically significant difference in negative saving scores, indicating the superiority of the irradiated animal over the normal animal with respect to reversal problems of this type.

Radiobiological Lab., U. of Texas, Austin.
LATENT EFFECTS OF CHRONIC WHOLE-BODY IRRADIATION ON MONKEYS WITH MIXED SOURCE RADIATION, by Roger T. Davis, Claude B. Elam, and Arnold A. McDowell. Feb 58, 32p. 21 refs. AFSAM rept. 57-59.
Order from LC mi $3.00, ph $6.30 PB 135 065

Monkeys were studied on learning tasks given 5 1/2 months before, 7 1/2 months during, and 13 1/2 months after chronic mixed source irradiation. The results indicated no significant dose response in learning tasks. A syndrome of changes was noted: (1) irradiated animals had significantly different food preferences from the controls; (2) animals receiving the higher radiation doses showed stronger preferences for food in lower spatial quadrants than did control and lower dose group animals; (3) irradiated animals made more cage-directed, but fewer rapid-energy responses than did control group animals; (4) control animals were more distracted by extraneous sounds, both in the free cage and under formal laboratory task situations.

Radiobiological Lab., U. of Texas, Austin.
SOME PERSISTING EFFECTS OF NUCLEAR RADIATION EXPOSURE ON THE BEHAVIOR OF THE RHESUS MONKEY, by A.A. McDowell and W. Lynn Brown. Apr 58, 4p. 7 refs. AFSAM rept. 58-63.
Order from LC mi $1.80, ph $1.80 PB 135 057

Ten 10-minute observations were made of the free-cage behavior of each of 48 monkeys during days 31 through 60 following exposure of 40 of the monkeys to a nuclear detonation. It was found that the frequency of responses to body parts was significantly greater for the irradiated animals than for the control animals. The frequency of defecation under the experimental conditions was also significantly greater for the irradiated animals than for the control animals.

School of Aviation Medicine, Randolph AFB, Tex.
REACTION OF ETHYLENIMINE WITH THIOUREA AND ITS DERIVATIVES, by Stanley J. Brois. Jan 58, 11p. 27 refs. Rept. no. 58-15.
Order from LC mi $2.40, ph $3.30 PB 135 447

A new and convenient method for the preparation of 2-aminoethylisothiuronium (AET) derivatives is reported. In the presence of suitable acid catalysts, ethylenimine (aziridine) was employed to S-alkylate thiourea quantitatively by a rapid, nucleophilic displacement reaction at 10°C. Under these reaction conditions, several 1-monosubstituted 2-thioureas, a cyclic thiourea, and a 1,3-di-substituted 2-thiourea were successfully condensed with the imine. The proposed SN2 mechanism for this reaction and the advantages of S-alkylation by aziridine in preference to 2-halogen-ethylamines are discussed. The derivatives, described for the first time, represent a series of homologs synthesized in conjunction with a radioprophylactic program.

CHEMISTRY

Analytical Chemistry

Materials Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
THE EVALUATION AND ADAPTION OF THE BROMINATION TECHNIQUE OF DETERMINING OXYGEN IN METALS, by Lois A. Keyser and Charles D. Houston. Rept. for Jan-Aug 57 on Materials Analysis and Evaluation Techniques. Aug 58, 24p. 3 refs. WADC Technical Note 58-56; AD-155 821.
Order from OTS $1.00 PB 151 250

This paper contains laboratory results and discussion of the problem of determining oxygen in titanium and other metals using the technique of bromination. The gravimetric bromination equipment was adapted for use with the conductometric carbon

dioxide determinator so that the length of time of bromination could be shortened and a lower range of oxygen could be measured accurately. An evaluation of the method and the recommendations for its use is given.

Naval Powder Factory, Indian Head, Md.
DESIGN AND CONSTRUCTION OF A GAS-LIQUID PARTITION CHROMATOGRAPHIC UNIT, AND ITS APPLICATION TO THE QUANTITATIVE ANALYSIS OF LIQUID SOLUTIONS, by L. Browning and J.O. Watts. Oct 56, 39p. 4 refs. Technical rept. no. 91; NAVORD rept. no. 5352.
Order from OTS $1.00 PB 151 008

A gas-liquid partition chromatographic unit has been designed and installed in a commercial-type relay rack. A specially constructed control panel, sample-injection system, and thermal conductivity cell facilitate modification of the unit for new applications. Ethanol-water-ether, carbon tetrachloride-acetone, ethanol-chloroform, and carbon tetrachloride-chloroform solutions have been quantitatively analyzed by measuring the areas under the recorded curves and applying a unique empirical correction.

Watertown Arsenal Labs., Mass.
BROMINATION METHOD FOR THE SEPARATION AND DETERMINATION OF CERIUM IN TITANIUM, by M.P. Brash and A.B. Goulston. Aug 57, 15p. 10 refs. Rept. no. WAL 401/271.
Order from OTS $0.50 PB 131 946

A bromination procedure has been developed which separates most of the titanium and the alloying elements from cerium. A series of chemical separations then removes the remaining interfering elements. Cerium may be finally determined by gravimetric, volumetric, or colorimetric procedures. The precision is represented by a coefficient of variation of 0.4%. The bromination procedure requires 90 min. for 2 samples and 2 hr is required for subsequent procedures.

Inorganic Chemistry

Eagle-Picher Research Labs., Joplin, Mo.
FUNDAMENTAL STUDIES OF THE LEAD-OXYGEN SYSTEM, by P.E. Jensen, S.E. Witherspoon, and E.J. Ritchie. Annual summary rept. no. 3, 1 Aug 56-31 July 57, on Contract Nonr-1513(00). Aug 57, 34p. 6 refs. Rept. 57-84.
Order from LC mi $3.00, ph $6.30 PB 135 719

A unit cell for yellow litharge has these characteristics: crystal class, Hexagonal; edge lengths, $a_o = 17.18$ A°, $c_o = 17.60$ A°; approx 117 PbO units per cell; density, 9.30 to 9.88.

Laval U. (Canada).
SECOND-ORDER UNIMOLECULAR KINETICS IN THE THERMAL DECOMPOSITION OF HYDROGEN PEROXIDE VAPOR, by W. Frost and Paul A. Giguere. Rept. on Contract AF 18(500)492. 27 June 58, 28p. 22 refs. AFOSR TN-58-587; AD-162 110.
Order from LC mi $2.70, ph $4.80 PB 135 562

The thermal decomposition of hydrogen peroxide vapor has been re-investigated by the static method as a function of initial pressure at pressures up to 22 mm. Hg, and in the presence of inert gas (helium, oxygen and water) up to 100 mm. Hg. In each case the apparent first-order rate constant increased linearly with pressure. It is demonstrated that under the present experimental conditions the pyrolysis of hydrogen peroxide shows behavior typical of an elementary unimolecular reaction in its low-pressure second-order region. The reaction was accompanied by a heterogeneous decomposition which in the presence of foreign gas became inhibited. Helium was used as inhibitor over the temperature range 430-470°C, which permitted calculating the activation energy for activation with peroxide and with helium. The results can be satisfactorily accounted for by assuming a critical energy of 47-50 kcal and 5 effective classical oscillators for activation with peroxide and 3 with helium, provided deactivation occurs on every collision. Kinetic evidence against this assumption is briefly discussed.

Pennsylvania U., Philadelphia.
INTERACTION OF DISILOXANE WITH ALUMINUM HALIDES, by William A. Kriner (thesis) Alan G. MacDiarmid, and E. Charles Evers. Technical rept. no. 2 on Contract Nonr-551(21). Sep 57, 19p. 25 refs.
Order from LC mi $2.40, ph $3.30 PB 135 732

$(SiH_3)_2O$ has been shown to react rapidly with $(CH_3)_4Al_2Br_2$ to give the new volatile "electron-deficient" compound $(CH_3)_4Al_2(OSiH_3)_2$. Disiloxane reacts at low temperatures with aluminum halides to give the corresponding silyl and silylene halides and monosilane. The rates of reaction are correlated with those of similar reactions involving other silicon and also methyl compounds.

Westinghouse Electric Corp., East Pittsburgh, Pa.
EARLY DEVELOPMENT STUDIES ON THE PREPARATION OF MANGANESE BISMUTHIDE BY A LOW TEMPERATURE REACTION, by A. Goldman and G.I. Post. Rept. on Solid State Research and Properties of Matter, Contracts AF 33(616)309 and AF 33(616)5555. July 58, 15p. 13 refs. WADC Technical Note 58-237; AD-155 829.
Order from OTS $0.50 PB 151 318

A study has been made on the feasibility of producing pure manganese bismuthide by the solid state reaction of fine manganese and bismuth powders as proposed by Cornish. Using a low temperature reaction process, manganese bismuthide of high purity has been produced by extended reaction programs (72 hours). Shorter reactions have produced material with a slightly lower content of MiBi. Samples were prepared in batches of up to two kilograms in size.

Consistent reproducibility of results, however, has not been established. The powders used in this process require thorough protection against oxygen or moisture during the preparation, reaction, and processing stages. Re-reaction of samples to improve magnetic yield is feasible if care is taken to prevent oxidation. Once a sample is oxidized or when a considerable melt occurs, re-reaction is no longer possible. Several attempts to react while milling were not successful.

Westinghouse Electric Corp., East Pittsburgh, Pa.
MERCURY PROCESS FOR MnBi PRODUCTION, by A. Goldman and G.I. Post. Rept. on Solid State Research and Properties of Matter, Contract AF 33-(616)5555. July 58, 15p. 9 refs. WADC Technical Note 58-238; AD-155 830.
Order from OTS $0.75 PB 151 330

A method for producing manganese bismuthide has been investigated wherein the manganese and bismuth are first incorporated into a mercury slurry. The mercury is subsequently removed by vacuum distillation to prevent oxidation and reduce the boiling point. Saturation magnetization values ranging between 60 and 80 e.m.u./gm have been measured at liquid nitrogen temperature. The procedure involves very little preparation of materials, but adequate stirring must be maintained. Powdering the product and heating it to about 300°C for some time improves the magnetic moment of the sample considerably.

Organic Chemistry

Florida U., Gainesville.
PREPARATION OF FLUORINE-CONTAINING COMPOUNDS, by H.C. Brown, R.D. Dresdner and others. Semi-annual technical rept. for 1 Aug 56-31 Jan 57 on Contract Nonr-580(03). Feb 57, 37p. 5 refs.
Order from LC mi $3.00, ph $6.30 PB 135 599

For later report see PB 134 987.

Florida U., Gainesville.
PREPARATION OF FLUORINE-CONTAINING COMPOUNDS, by H.C. Brown, R.D. Dresdner and others. Semi-annual technical rept. for 1 Feb-31 July 57 on Contract Nonr-580(03). Aug 57, 31p.
Order from LC mi $3.00, ph $6.30 PB 134 987

Institute of Tech., U. of Minnesota, Minneapolis.
DIFFUSION IN CATALYTIC HETEROGENEOUS SYSTEMS: STUDIES IN VAPOR PHASE ESTERIFICATION, by Neal R. Amundson and Michael Stusiak. Rept. on Contract N8onr-662(17). Nov 52, 222p. 39 refs. AD-5895.
Order from LC mi $9.90, enl. pr. $26.30 PB 136 776

The continuous vapor-phase reaction of EtOH and MeCOOH to form EtOAc and H_2O was carried out in a fixed-bed reactor. The reactor was of stainless steel 4 ft long and 2 in. in diameter and was heated by circulating Dowtherm A enclosed in a jacket. The bed contained 2170 g of dry catalyst (WO_3 carried on porous Al_2O_3 spheres averaging 0.523 cm in diameter). The dried balls were impregnated with a solution of H_2WO_4 in concentrated NH_4OH. The balls were dried and heated at 450°C to decompose the tungstate. A catalyst particle had an apparent density of 1.6886 g/cc, an absolute density of 3.860 g/cc, and a fractional void volume of 0.5625. The balls contained 7.87% WO_3 by weight. The liquid reactants were pumped through flowmeters into electrical preheaters. The vaporized reactants entered the reactor at the top, passed through the catalyst bed, and then to the condenser. The product from the condenser was immediately analyzed. The apparatus was automatically temperature-controlled and operated slightly above atmospheric pressure. Kinetic data were obtained at 140°, 160°, and 180°C; a surface reaction was the rate-controlling step. A rate equation was derived which reproduced the data; at 160°C, the rate is given by

$$r = 0.0123 \frac{p_A p_B - (p_R p_S / K)}{(1 + 3.327\, p_A \quad 1.075\, p_S)^2},$$

where p_A, p_B, p_R, and p_S are the partial pressures of acid, alcohol, ester, and H_2O, respectively. The data indicated that the reaction approximated a pseudo-first-order relationship when only the feed rate was varied. Intraparticle diffusion was not an important factor in determining the over-all reaction rate.

Naval Research Lab., Washington, D.C.
THE DISTRIBUTION OF ACETIC ACID BETWEEN SOLVENT AND SOAP MICELLES IN BENZENE SOLUTIONS, by W.D. Bascom and C.R. Singleterry. Interim rept. 6 Nov 58, 8p. 10 refs. NRL Rept. 5226.
Order from LC mi $1.80, ph $1.80 PB 135 642

The distribution of acetic acid between benzene and micelles of sodium dinonylnaphthalene sulfonate, magnesium dinonylnaphthalene sulfonate, and magnesium phenylstearate was examined by measurements of the vapor composition in equilibrium with such systems. In each case the initial increments are more firmly bound than later portions, the amount of strongly bound acid ranging from one to two molecules per cation present. The magnesium salts bind the acid more strongly than the sodium compound. The partition coefficient for acid at higher concentrations is one or two orders of magnitude smaller than that for the initial increments. Its magnitude depends on the nature of the anion in the micelle. Water was found to reduce the initial acid-binding capacity of the magnesium salts. The data indicate that the coordinating properties of the cation are a major factor in the initial firm binding of acetic acid by oil soluble soap micelles, but that significant amounts of acid are more loosely held by forces which may be attributed to the organic anion present. This work confirms the qualitative observations that have already been reported from this Laboratory on acid sequestration by micellar soaps in oil. The data

reported provide a quantitative indication of the value of this acid-getting mechanism in lubricating oil detergency. They show that solubilization by micelles is an important factor in detergency, and that the effectiveness of micellar detergents may be expected to vary directly with the coordinating tendency of the metal ion present in the soap.

Naval Research Lab., Washington, D.C.
TELOMERIZATION: A REVIEW OF THE LITERATURE, by R.B. Fox and D.E. Field. Interim rept. 19 Nov 58, 69p. 381 refs. NRL rept. 5190.
Order from OTS $2.00 PB 131 930

A brief explanation is given for the processes involved in the formation of short polymer chains by chain transfer of a polymer radical with a substance other than the monomer. The over-all process has been designated as "telomerization" and can be represented by $XY + nCR_1R_2{=}CR_3R_4 \rightarrow X(CR_1R_2CR_3R_4)_nY$. A review has been made of the literature in which materials and processes of this type appear. The descriptive portion of the survey has been given according to the nature of the end group molecule XY. An appendix contains a listing of synthesized telomers based on the nature of the olefin.

Rochester U., N.Y.
PHOTOCHEMICAL STUDIES. 53. ISOPROPYL IODIDE, by G.R. McMillan and W. Albert Noyes, Jr. Rept. on Contract AF 18(600)1528. 6 Nov 57, 18p. 16 refs. AFOSR TN-57-685; AD-136 681.
Order from LC mi $2.40, ph $3.30 PB 135 594

At 35°C, mixtures of 0.4 ml iodine with EtI, PrI, sec-BuI, and Iso-PrI which were illuminated with a high-pressure mercury arc lamp produced alkenes in the ratios of 1:5:21:22; the filter was 3 mm Corning glass 3484 which absorbed wavelengths below 5070A. MeI yielded no detectable products. Only negligible amounts of hydrocarbons were formed in thermal blanks upon irradiation of the pure alkyl iodide. Propylene was formed by the illumination of I-iso-PrI mixtures with radiation filtered for 4000 to 5510 A or for 5790 A. The ratio of butene-2 to butene-1 from sec-BuI was 3.4 and 3.7:1. The butene-2 was at least 85% the trans isomer. The rate of propylene formation was unaffected by the presence of 75 mm of dry air. The photochemical decomposition of iso-PrI was studied. H, CH_4, and 2, 3-dimethylbutane were not products of the propylene yield in the absence of Hg at constant intensity. The rates showed a decrease only after extended photolyses. C_3H_8 was greatly decreased in the presence of added iodine, especially at the longer wavelengths, but increased after long photolysis.

Physical Chemistry

Grinnell College, Grinnell, Iowa.
ION EXCHANGE WITH CRACKING CATALYSTS, by Joseph D. Danforth, William Hamilton, and John Chase. Technical rept. 11 on Contract N8onr-671 (00). Aug 57, 27p. 10 refs.
Order from LC mi $2.70, ph $4.80 PB 135 745

Contents:
Exchange of the acetates and chlorides of potassium and barium on silica, alumina and silica-alumina composites.
The adsorption and exchange of alkali, alkaline earth and lanthanum ions by the silica-alumina cracking catalyst.
A precise study of exchange by $BaCl_2$ and KCl solutions on the silica alumina cracking catalyst.
Exchange and titration data for other catalyst samples.
Results and Conclusions.

Johns Hopkins U., Baltimore, Md.
ISOTOPIC EXCHANGES BETWEEN DIBORANE AND DIHYDROPENTABORANE, by Thomas E. Larson and W.S. Koski. Technical note no. 6 on Contract AF 18(600)1526. June 57 [16]p. AFOSR TN-57-324; AD-132 396.
Order from LC mi $2.40, ph $3.30 PB 135 265

The kinetics of the exchange of deuterium and $_B{}^{10}$ between diborane (B_2H_6) and dihydropentaborane (B_5H_{11}) were investigated. The order of both exchanges was 0.5 with respect to B_5H_{11} and 1.0 with respect to B_2H_6. The reaction was a homogeneous one. The ratio of the deuterium rate constant to the boron rate constant was approximately 2. All of the deuteriums and borons and both molecules participated in the exchange. A possible mechanism for the exchange is proposed and consists of a rapid equilibrium between dihydropentaborane and two fragments arising from the dissociation of B_5H_{11}. This is followed by a rate determining bimolecular collision between one of the fragments and diborane resulting in the isotopic exhange.

Materials Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
THE IDENTIFICATION OF CRYSTALLINE FERROCENES BY X-RAY DIFFRACTION, by William L. Baun. Rept. for Dec 57-Apr 58 on Materials Analysis and Evaluation Techniques. July 58 [21]p. 6 refs. WADC Technical Note 58-142; AD-155 761.
Order from OTS $0.75 PB 151 310

X-ray diffraction patterns for twenty three solid crystalline ferrocenes are presented. These compounds are of interest because of their high thermal stability and wide potential applications. They are particularly well suited for x-ray diffraction analysis because of their crystalline nature and the individualistic patterns obtained from these compounds.

Ohio State U. Research Foundation, Columbus.
SOME OPTICAL AND MAGNETIC PROPERTIES OF IRRADIATED LiF, by R.T. Bate and C.V. Heer. Rept. on Contract AF 18(600)1003. Jan 58, 21p. 27 refs. AFOSR TN-58-125; AD-152 152.
Order from LC mi $2.70, ph $4.80 PB 135 237

The optical oscillator strength of the F-band in LiF is determined as $f_L = 0.82$ from combined optical and magnetic measurements on x-irradiated and neutron irradiated samples. The number of F-centers formed in LiF as a function of neutron dosage was measured over a broad range of dosage by either optical or magnetic techniques. The formation of F-centers saturates in the vicinity of 8×10^{19} centers/cm^3; and saturation occurs for neutron dosages considerably smaller than required for saturation of vacancies and interstitials. Experimental evidence is presented to indicate that F-centers are separated by more than 6 lattice units in the most densely colored samples.

Ohio State U. Research Foundation, Columbus.
STUDY OF INFRARED EMISSION FROM FLAMES, by Ely E. Bell, Frederick P. Dickey and others. Final rept. pt. 3 on Contract AF 30(602)1047. Sep 56, 47p. RADC TR-57-51; AD-114 330.
Order from LC mi $3.30, ph $7.80 PB 137 102

Part 3 concerns the effect of noncombustible additives to flames, the radiance of hot gases independent of a combustion process, and the study of the radiance of flames produced by a flat-flame burner.

Politecnico di Milano (Italy).
ELECTROCHEMICAL BEHAVIOR OF POLYCRYSTALLINE AND SINGLE CRYSTAL LEAD, by Guido Poli. Technical note no. 12 on Contract AF 61(514)733C. Dec 57, 18p. 15 refs. AFOSR TN-58-238; AD-154 140.
Order from LC mi $2.40, ph $3.30 PB 135 494

Experiments were conducted concerning the anodic and cathodic overvoltages of 25°C of polycrystalline and single-crystal Pb electrodes, in aqueous solutions of sulfamate, perchlorate, and fluoborate (0.5M/1 Pb + 0.5M/1 of free acid). The single crystals were prepared by a modified Bridgman method. The measurements were made by the current-pulse direct method, i.e. by sending, in the cell, rectangular current pulses of different intensity and duration, by increasing and then decreasing values of current density. Overvoltages were very small on both the anodic and cathodic sides. Overvoltages were lower on the (100) and (110) planes than on (111) on both anodic and cathodic sides. Crystal growth occurred from isolated nuclea. The EV maxima at the start were tendentially symmetric on anodic and cathodic sides. The maxima values were higher and the decrement rate was greater for the (111) plane than for the (110) and (100) planes. A moderate inhibiting influence was contributed to the fluoborate anion.

Rocketdyne, Canoga Park, Calif.
RESEARCH ON NITRIC ACID-SUPPORTED COMBUSTION, by G. Casaletto. Quarterly progress rept. for period ending 15 Jan 58 on Contract AF 49(638)-163. Feb 58, 23p. AFOSR TN-58-264; AD-154 166.
Order from LC mi $2.70, ph $4.80 PB 135 547

Studies of flame speeds, flammability limits, temperatures, products, and spectra are being employed to obtain information about the various mechanisms involved.

Stanford Research Inst., Menlo Park, Calif.
CALCULATION OF THE ENERGIES OF GASEOUS ALKALI HALIDE DIMER MOLECULES, by Thomas A. Milne and Daniel Cubicciotti. Technical note no. 2 on Contract AF 49(638)50, May 58, 17p. 11 refs. AFOSR TN-58-475; AD-158 286.
Order from LC mi $2.40, ph $3.30 PB 135 405

The energies of formation of gaseous alkali halide dimer molecules from the monomers have been calculated using a model suggested by Pauling. The dimers were found to be from 40 to 60 kcal more stable, energetically, than their separated monomers. These results are in agreement with the experimental data available. The free energies of dimerization were estimated and used to predict the trends observed in the ratio of monomer to dimer for several salts. It was found that the energies of dimers with different cations were slightly more negative than the average of the two pure dimers. Some experimental results supporting this conclusion are presented.

TRG, Inc., New York.
TRANSFORMATIONS OF SOLUTIONS OF DIFFUSION EQUATIONS IN TWO-MEDIUM GEOMETRIES, by Visvaldis Mangulis. Rept. for 15 Apr 57 to 15 Apr 58 on Primary Shield Subsystems, Contract AF 33(616)5187. Aug 58 [26]p. WADC Technical rept. 58-112; AD-155 771.
Order from OTS $0.75 PB 151 313

The purpose of the work performed was to find transformations of solutions of diffusion equations in certain two-medium situations for isotropic sources having simple geometric shapes. It is expected that the results will be applicable to some shielding problems. The transformations were obtained for the following sources: point, disk, infinite plane, and solid cylinder sources interior to a semi-infinite medium joined at an infinite plane surface to a source free semi-infinite medium of a different material, and spherical shell or solid sphere sources interior to a spherical medium imbedded in an infinite medium of a different material.

University of Southern California, Los Angeles.
PROPERTIES OF SOLUTIONS IN THE NEIGHBORHOOD OF THE CRITICAL TEMPERATURE OF THE SOLVENT, by Sidney W. Benson, Charles S. Copeland and others. Technical rept. no. 6, 1 Dec 55-30 June 57, on Contract N6onr-238(11). Aug 57, 58p. 32 refs.
Order from LC mi $3.60, ph $9.30 PB 135 729

Section I presents results on the conductivity of HCl in aqueous solution between 300° and 383°C. Values of the dissociation constant for HCl have been deduced and compared with those previously

obtained for NaCl. Section II presents results of the behavior of the dielectric constant of ethanol in the neighborhood of the critical temperature. Section III presents interesting considerations on the volumes of ions in solutions.

EARTH SCIENCES

Climatology and Meteorology

Air Weather Service, Washington, D.C.
FORECASTING AIRCRAFT ICING. Jan 53, 27p. 28 refs. AWS Manual no. 105-39; AD-5014.
Order from LC mi $2.70, ph $4.80 PB 135 392

Discussions are presented of the phenomenon of supercooled water, mechanics of icing, and cloud structure. A cloud-phase chart was developed, and probable maximum ice intensity was estimated.

Cooperative Research Foundation, San Francisco, Calif.
WIND CORRELATIONS, by Arnold Court. Final rept. on Contract AF 19(604)2060. 21 Mar 58, 31p. 11 refs. AFCRC TR-58-229; AD-152 512.
Order from LC mi $3.00, ph $6.30 PB 134 398

Three mathematical models, each more complicated than the previous one, have been developed to describe the "decay" of the correlation between winds at two levels as the separation between levels increases. The third model, that of a damped wave, seems applicable not only to winds in the vertical, but to the decay with distance, or with time, of a wide variety of meteorological correlations. Its application, however, requires data at much closer intervals than the 2-km separation of the tabulations available for the study.

Dugway Proving Ground, Utah.
SYMPOSIUM ON MICROMETEOROLOGY: TURBULENT DIFFUSION, held 28-29 June 1954, 107p.
Order from LC mi $5.70, ph $16.80 PB 135 593

Contents:
Studies of turbulent diffusion in the atmosphere, by F.N. Frenkiel and I. Katz
Problems in the statistical theory of turbulent diffusion, by Leo J. Tick
Solutions of two-dimensional diffusion equations (Abstract), by Wellington Rounds, Jr.
Preliminary report on the relationship between the synoptic weather chart and low level micrometeorological data, by M.L. Barad and B. Davidson
Effect of micrometeorological parameters on short-time behavior of volume sources (Abstract), by Scott D. Thayer and C. G. Whitacre
Gaseous diffusion in the lower layers of the atmosphere (Abstracts), by William D. Sellers
Statistical methodology in predicting gaseous diffusion, by Gerald J. Hahn
Appraisal of approaches to the turbulent diffusion problem, by George H. Milly
The effects of cities upon horizontal and vertical temperature gradients (Abstract), by F.S. Duckworth and J.S. Snadberg

Laboratory of Climatology, Drexel Inst. of Tech., Centerton, N.J.
WATER BALANCE OF THE MEDITERRANEAN AND BLACK SEAS, by Douglas B. Carter. Technical rept. no. 3 on Contract Nonr-1617(00). 1956, 65p. 34 refs. Publications in Climatology v. 9, no. 3.
Order from LC mi $3.90, ph $10.80 PB 135 693

The monthly water balance of the Mediterranean and Black Seas is examined in terms of the gains and losses of fresh water. The components of the balance, evaporation losses and gains by runoff and precipitation, are estimated by climatological methods. The estimate of runoff is made on the basis of an areal integration of runoff determined by Thornthwaite's method at more than 1400 climatological stations in the basin. Evaporation, the most difficult to assess, is adjusted from an integration of the extrapolated values of potential evapotranspiration at 325 island and shore stations. The present investigation indicates the evaporation has been grossly overestimated previously; runoff has been considerably overestimated because other studies have utilized runoff measurements from a part of the area as an index of the total runoff; precipitation has been slightly underestimated in several previous investigations; the changing and seasonal character of net flows through the Bosporus and the Straits of Gibraltar has been neglected; and, the volume of water exchanged through the Straits of Gibraltar with the Atlantic has been overestimated.

Naval Research Lab., Washington, D.C.
AN AEROGRAPH FOR TEMPERATURE AND HUMIDITY SOUNDINGS FROM AIRCRAFT, by R.E. Ruskin, B.G. Julian, and J.M. Averitt. Final rept. 22 Aug 58, 21p. 6 refs. NRL Rept. 5166.
Order from LC mi $2.70, ph $4.80 PB 133 125

Aerograph AN/AMQ-8 now being procured by the U.S. Navy for aircraft weather reconnaissance provides a simultaneous digital record of temperature, humidity, and static pressure vs time, and a graphical presentation of these parameters for each of the columns of digital data. The temperature recorded by this instrument is measured by an axial-flow vortex thermometer probe which automatically corrects for the dynamic heating due to the plane's speed. Humidity is measured in the same vortex probe by use of a cylindrical carbon hygrometer element surrounding the temperature bulb. Thus the temperature at the hygrometer can be directly read from the temperature indication. Washout of the hydrometer element is eliminated during flight by the centrifuging action of the vortex in which the hygrometer is mounted. Modifications permit use of this aerograph packaged in a wing nacelle or with a trailing sonde for helicopter use.

Geodesy

Army Engineer Research and Development Labs., Fort Belvoir, Va.
UTILIZATION OF SHORAN FOR MAPPING, by Archer M. Wilson. Interim rept. 3, 5 Nov 48, declassified Nov 53. 50p. Rept. 1081.
Order from LC mi $3.30, ph $7.80 PB 137 016

An analysis is presented of errors in the Shoran-controlled mapping photography obtained to date, and conclusions are included regarding sources of error and operational use. The principal sources of instrumental errors which affect internal map accuracy are timing non-linearity and pip alignment; the principal sources of instrumental errors which affect the positioning of the map as a whole are equipment delays and signal intensity; position errors introduced by errors in flying height determination are of least consequence when the Shoran aircraft operates at distances greater than 50 miles from the ground stations; the multiplex BZ curve method of establishing photo tilts is sufficiently accurate for use with the present Shoran equipment; Shoran-controlled photogrammetric maps can be compiled by the multiplex method with an internal map accuracy such that 90 percent of the features will have a relative accuracy of approximately ±104 Feet; when no existing identifiable horizontal control is available a "shift" of the entire map sheet as much as 200 feet with respect to the horizontal decreased and operational procedures are perfected; an improved method of recovering photo plumb points is required if random Shoran instrumental errors are decreased; the Shoran system, in its present state of development, is ready for use in positioning photography whenever the accuracy obtainable with this new tool satisfies mapping requirements.

Georgetown Coll. Observatory, Washington, D.C.
USAF-GEORGETOWN SOLAR ECLIPSE PROJECT. Final rept. June 53-Jan 57, on Contract AF 19(604) 880. Jan 58, 18p. AFCRC TR-58-206; AD-146 862.
Order from LC mi $2.40, ph $3.30 PB 135 559

A method of measuring long arcs on the earth's surface by means of observations of solar eclipses is discussed. Two expeditions in which this method was employed are described in detail as to sites, equipment, organization and data recorded. The method of analysis of the observational data is also included, This covers the following points; (a) exploration of data, (b) development of theory, (c) correction of constants, (d) improvement of methods, and (e) reduction of photographic data.

Mapping and Charting Research Lab., Ohio State U. Research Foundation, Columbus.
THE GRAVITY FIELD FOR AN ELLIPSOID OF REVOLUTION AS A LEVEL SURFACE (III), by W.D. Lambert. Technical paper on Contract AF 19(604)1963. Mar 58, 59p. Technical paper no. (716)-2-261; AFCRC TN-58-240; AD-152 472.
Order from LC mi $3.60, ph $9.30 PB 135 517

This paper gives formulas for the gravity field outside of an exact ellipsoid of rotation, assumed to be an exact equipotential surface under the combined effects of its own gravitational attraction and the centrifugal acceleration due to uniform rotation about its minor axis. Ordinary polar coordinates in space are used instead of the special curvilinear coordinates. The mathematical developments are given in some detail for the benefit of possible students. The results are applicable to geodetic analyses of observations on an artificial satellite.

Oceanography

Naval Proving Grounds, Dahlgren, Va.
CALCULATION ON NORC OF SOURCE FUNCTIONS FOR SHIP WAVES, by A.R. DiDonato. Interim rept. for May 57-Mar 58,. Apr 58, 88p. 9 refs. NPG rept. no. 1588.
Order from LC mi $4.80, ph $13.80 PB 135 001

A perfect fluid of finite depth is set into motion by a point source moving at a constant horizontal speed beneath the free surface. A particular method is evaluated for computing the velocity at a point (not too near the source) fixed in the fluid. The method of computation requires the calculation of a Fourier integral along the real axis by a contour integration in the complex plane.

Navy Hydrographic Office, Washington, D.C.
STUDY OF THE TYPES, SEASONS OF ATTACHMENT, AND GROWTH OF FOULING ORGANISMS IN THE APPROACHES TO NORFOLK, VIRGINIA, by William E. Maloney. May 58, 41p. 3 refs.
Order from HO* $0.60 HO TR-57

This report gives the results and analysis of one year's (April 1956 to April 1957) marine biological fouling data obtained along the bottom near Thimble Shoal Channel in lower Chesapeake Bay.

Physics of the Atmosphere

Deutscher Wetterdienst, Aachen (West Germany).
ON PARALLELISM OCCURING IN THE REGISTRATION OF POTENTIAL GRADIENT AND GENERAL LOCAL BRIGHTNESS, by G. Fries and H. Dolezalek. Technical note no. 7 on Contract AF 61(514) 640. Mar 56, 17p. AFCRC TN-57-255; AD-110 267.
Order from LC mi $2.40, ph $3.30 PB 133 809

When continuously registering the atmospheric potential gradient and the air-earth-current on one hand and the general local brightness on the other hand, occassional parallelisms and anti-parallelisms between these elements were observed. Communication of these observations and some hypotheses with regard to their interpretation are given here.

*U.S. Navy Hydrographic Office, Washington, D.C.

Illinois State Water Survey, Urbana.
AN EVALUATION OF RAINDROP SIZING AND COUNTING INSTRUMENTS, by John E. Pearson and Gordon E. Martin. Scientific rept. no. 1 on Contract AF 19(604)1900. Nov 57, 123p. AFCRC TN-57-628; AD-146 773. (In cooperation with U. of Illinois)
Order from LC mi $6.30, ph $19.80 PB 134 393

A study was made of the merits of devices and techniques used to determine size-distribution of raindrops and cloud droplets. The devices and techniques were classified into 11 major sections, each including a discussion of the devices or techniques and an annotated bibliography. Sections are also provided on (1) artificial drop production, (2) determination of drop sizes for calibration purposes, (3) drop illumination, (4) raindrop characteristics, (5) measuring liquid H_2O content of the atmosphere, (6) automatic sizing and counting of stains or images, (7) low-level atmospheric turbulence, and (8) an index of authors.

ENGINEERING

Naval Ordnance Lab., White Oak, Md.
INVESTIGATION OF THE COMPLEX TEMPERATURE COEFFICIENTS OF STATIC DEFLECTION FOR HELICAL COMPRESSION SPRINGS, by Walter R. Wise, Jr. Thesis, Sep 57, 102p. 6 refs. NAVORD rept. 4455.
Order from LC mi $5.70, ph $16.80 PB 135 436

The static deflection of steel, helical compression springs as a function of pitch angle, spring index, load and temperature is investigated in the range -80°F to 160°F. It is shown implicitly that an analytical solution for the general case of static deflection would be extremely difficult to obtain. A spring testing machine, the accuracy of which is independent of temperature and friction, was designed and developed especially for the purpose of obtaining the deflection data required for the work. Experimental values of the temperature coefficients of static deflection were determined for a broad configuration range of steel, helical compression springs under various loads in the temperature range -80°F to 160°F. It was determined from examination of the temperature coefficients that the static deflection of a helical compression spring for a given load may increase or decrease with a change in temperature depending upon the configuration of the spring and the load imposed upon it, and, further, that for a constant load requirement the configuration parameters of a spring may be chosen such that static deflection of the spring is independent of temperature in the range, -80°F to 160°F.

Work Saving International, Washington, D.C.
SURVEY AND ANALYSIS OF CARGO CONTAINERS FOR CARGO SHIPS: UNITED STATES AND WESTERN EUROPE. Rept. on Contract MA-1786. 25 Aug 58, 42p.
Order from OTS $1.00 PB 151 239

Contents:
Importance of cargo handling to the Merchant Marine
The shipping container in the Maritime Trade
General conclusions of container study
Definition of terms
Scope of report
Influence of rail cars and trucks on container sizes
The American Standards Association
Size of Maritime shipping containers now in service
Size of shipping containers used in land transport
Container studies by steamship companies
Recent technical meetings
United States Army Transportation Corps
Department of the Navy
Container study, U.S. Department of Commerce, 1933
Summary of containers in Western Europe
Standardization in the container industry
International meetings on containers
Census of containers in Western Europe
Sizes of containers
Problems of transfer
Problem of weight
Ownership of containers
Customs regulations and tariffs
Maritime container services in Western Europe
Sizes of American shipping containers
Maritime container regulations of the European Federation of Railways
Regulations of containers for rail traffic of the European Federation of Railways

Aeronautical Engineering

Advisory Group for Aeronautical Research and Development, Paris (France).
PROCEEDINGS OF THE 7th AGARD GENERAL ASSEMBLY (Procès-verbal de la septième Assemblée générale de l' AGARD). Washington AGARD conference, 18-26 Nov 1957. Dec 57, 109p. (Partly in French).
Order from NASA*

Arkwin Industries, Inc., Westbury, N.Y.
DEVELOPMENT OF HIGH TEMPERATURE, SELF-SEALING QUICK DISCONNECT AIRCRAFT HYDRAULIC COUPLINGS, by Joseph Marinelli. Rept. for Apr 56-June 58 on Aircraft Hydraulic Systems, Contract AF 33(600)32609. July 58, 65p. WADC Technical rept. 58-387; AD-155 859.
Order from OTS $1.75 PB 151 269

The design and development of high temperature, self sealing, quick disconnect aircraft hydraulic couplings suitable for use in missile and aircraft Type III hydraulic systems is described. These units must be capable of operating in a temperature range from -65° to 400°F. The development encompassed two classes of couplings: Class 3000 for units capable of operation at 3000 psi pressure and

*National Aeronautical and Space Administration, 1520 H Street, N.W., Washington 25, D.C.

Class 600 for units capable of operation at 600 psi pressure. The Class 3000 couplings were confined to 1/4, 3/8, 1/2, 3/4 and one inch tube sizes. The Class 600 was confined to the 1 1/4, 1 1/2, and two inch tube sizes. Coupling halves are only interchangeable with their respective sizes and cannot be connected to unlike halves. The units may be coupled or uncoupled with one hand in either a straight forward or aft motion and without the need for special tools. This makes the units ideally suited for installation and use in confined spaces. Inadvertent uncoupling cannot occur with applied load resulting from an acceleration up to 20g's. Opposing internal spring loaded parts tend to force the coupling halves apart. In the event the locking mechanism is not properly engaged the spring force will cause the units to separate. This separation will be clearly visible and show an unlocked position. In this unlocked position positive sealing occurs preventing external flow.

Army Transportation Research and Engineering Command, Fort Eustis, Va.
ARMY AIRCRAFT MAINTENANCE WORKSTAND, LOW-LEVEL, by Christmas A. Malami and William Lembeck. Final rept. May 58, 22p. AD-148 474.
Order from OTS $0.75 PB 131 970

The report covers the testing and evaluation of a low-level workstand designed for use in Army aircraft maintenance. An evaluation was made of the newly designed workstand and the workstand presently being used in the Army system. The former is more versatile than the latter and is readily adaptable to all necessary maintenance operations on fixed-wing aircraft and on small helicopters. The workstand is also suitable for the performance of many maintenance operations around the power plant and fuselage section of heavier helicopters.

David W. Taylor Model Basin, Washington, D.C.
NOTES ON THE DESIGN, CALIBRATION, INSTRUMENTATION, AND MAINTENANCE OF STRAIN-GAGE BALANCES, by Robert B. Ormsby, Jr. Nov 53, 63p. 4 refs. Aero rept. 854.
Order from LC mi $3.90, ph $10.80 PB 135 536

A compilation of information for the use of strain gages on wind-tunnel sting balances. Design criteria, gage application instruction, trouble-shooting guides, calibration techniques, and indicating equipment are discussed.

De Havilland Aircraft of Canada, Ltd.
REDUCTION OF THE EXTERNAL NOISE LEVEL OF OTTER UC-1 AIRCRAFT, by G.W. Johnston. Final rept. on Contract Nonr-2160(00). July 57, 93p. 9 refs.
Order from LC mi $5.40, ph $15.30 PB 135 588

It has been demonstrated that the exterior noise intensity of a conventional Otter aircraft employing a modified propeller and exhaust system may be quieted 21 db at take-off power and 16 db at cruise power. Noise reductions slightly superior to these were obtained with the final muffler configuration built; however, only brief tests were carried out with this design.

National Aeronautical Establishment (Canada)
EFFECT OF ICING ON AIRCRAFT EQUIPPED WITH VORTEX GENERATORS, by A.D. Wood and D.G. Gould. Apr 58, 13p. Lab. Rept. LR-220.
Order from LC mi $2.40, ph $3.30 PB 135 044

By reproducing in plastic the ice formation which has been found to build up on vortex generators tested under heavy icing conditions in a low temperature wind tunnel, it has been possible to carry out flight tests to determine the effects of such icing on vortex generator installations on a Harvard and on a CF-100 aircraft. From these tests it has been found that for an installation of delta-shaped, co-rotating vortex generators mounted well forward on the wing, icing of the generators has only a very small effect on the stalling speeds and no adverse effect on aircraft handling near the stall. Any increase in drag which occurs as a result of vortex generator icing is small and insufficient to be a cause of concern.

Research, Inc., Hopkins, Minn.
DEVELOPMENT OF HIGH DENSITY RADIANT HEATING EQUIPMENT AND MATERIALS TO SIMULATE AERODYNAMIC HEATING, by Andrew F. Kitchar. Rept. for 1 Feb 56-31 Jan 57 on Structural Testing at Elevated Temperatures, Contract AF 33(616)3392. Mar 57, 59p. 13 refs. WADC TR-57-159; AD-118 290.
Order from LC mi $3.60, ph $9.30 PB 135 916

The purpose of this program was to investigate methods for developing radiant heating equipment capable of providing 60 to 70 kilowatts per square foot at the surface of a specimen for at least five minutes in order to simulate aerodynamic heating. In order to do this there had to be a greater number of emitters per unit area than in any configuration previously developed. This resulted in component overheating problems. It was therefore necessary to render all components in such a high density radiant heating reflector unit usable at the higher temperatures they would encounter. The 1000-T3/CL tungsten filament quartz envelope emitter had to either be cooled or modified. In this case, success was realized by air cooling the reflector, the lamp envelopes, and water cooling the lamp end seals. The reflector had to be made to operate at elevated temperatures by either cooling or using a material which would not fail at these temperatures. It was possible to develop a trimaterial composite gold reflector material capable of operation at 1580°F. A number of gold-to-basemetal bonding methods were investigated in order to find a usable, low cost, efficient, high temperature infrared reflector. The investigation showed that the gold must be separated from the base metal by an inert layer, such as a ceramic coating, in order

to prevent the two from diffusing at high temperatures. The material is well suited as an infrared reflector.

Technical Development Center, Civil Aeronautics Administration, Indianapolis, Ind.
PRELIMINARY OPERATIONAL EVALUATION OF VOLSCAN MODEL GSN-3(XD-1), by Joseph P. O'Brien, Marvin H. Yost and others. June 58, 22p. Technical Development Rept. no. 330.
Order from OTS $0.75 PB 151 284

This equipment was designed as the terminal-area scheduling and control portion of a military traffic control and landing system. The FPS-8 radar on Deer Island provided the radar input for the tests. The results of this preliminary evaluation indicate that the VOLSCAN equipment tested at Deer Island is not suited for application to the common air traffic control system.

Technical Development Center, Civil Aeronautics Administration, Indianapolis, Ind.
REQUIREMENTS OF THRESHOLD LIGHTS, by H.J. Cory Pearson. Nov 58, 10p. Technical Development Rept. no. 272.
Order from OTS $0.50 PB 151 283

This report analyzes the functions and conditions of service of threshold lights and considers patterns and characteristics of equipment best adapted to meet the needs of this service. A study of the requirements for visibility and conspicuity from the outer segments of the areas to be covered indicates that this part of the function can be performed most practically by assigning it to a special lighting fixture. The basic pattern developed during this study consists of closely spaced units forming bars, supplemented by legs extending in along the runway edges.

United Aircraft Corp., East Hartford, Conn.
AIRPLANE DESIGN AS AFFECTED BY WEIGHT, VOLUME, AND DRAG. I. IDEALIZED RECTANGULAR ALL-WING SUPERSONIC AIRPLANE, by Terrence J. McGuire, Jr. 29 June 50, declassified 5 Nov 53, 45p. Rept. no R-72014-4; [NEPA-1488]; AD-149 838.
Order from LC mi $3.30, ph $7.80 PB 135 675

A general investigation has been made in order to establish a rational aircraft design technique which will satisfy any one of several likely design criteria commonly used to determine final aircraft choices. Particular emphasis is placed in this analysis and in those which are expected to follow, on the design sequence required for a supersonic aircraft. The principal factors involved in a successful design technique are considered to be weight, volume, and drag (or thrust). With this in mind, underlying relationships between weight, volume, and drag have been sought, certain trends noted, and a design sequence established and described. The recommended design method is in the form of a series of charts, a sample group of which are presented herein for the case of an idealized, rectangular, all-wing aircraft designed to fly at a Mach number of 1.5 and an altitude of 45,000 ft. While the sample design charts are derived so as to result in the selection of an optimum design on the basis of minimum powerplant size, the method is sufficiently general so that the charts may be drawn, for a given aircraft geometry, to satisfy any one of several design criteria, such as minimum powerplant size, minimum wing area, minimum aircraft gross weight. Furthermore, the recommended method is in such a form that it appears to be suited to an extension of the analysis to geometrical designs more comparable to the practical cases occurring in the design of actual aircraft.

Chemical Engineering

New York U. College of Engineering, N.Y.
GENERATION OF HYDROGEN FROM ACETYLENIC HYDROCARBONS, by Charles J. Marsel and Leonard Kramer. Final technical rept. for 15 May 55-14 May 56 on Contract DA 36-039-sc-64686. June 56, 46p.
Order from LC mi $3.30, ph $7.80 PB 135 508

The purpose of this investigation is to study the decomposition of acetylenic hydrocarbons, to obtain relatively pure hydrogen from this decomposition, and to investigate the feasibility of thus producing hydrogen in a practical field unit.

Ohio State U. Research Foundation, Columbus.
ELECTRICAL GENERATION OF OXYGEN (LITERATURE SURVEY), by R. David Nelson, Robert Tubbs and others. Final rept. for 13 Jan 57-13 Jan 58, Contract AF 33(616)3966. Aug 58, 106p. 1169 refs. WADC Technical rept. 57-739; AD-155 900.
Order from OTS $2.50 PB 151 260

A bibliography concerned with the electrical generation of oxygen and related fields which will aid future work in providing breathing oxygen for long term, extra-atmospheric flight is compiled. A total of 1169 references is presented as well as a complete subject index. A brief summary of the current status of development in this field is included.

Technical Operations, Inc., Arlington, Mass.
THE APPLICATION OF AN ANALOG COMPUTER TO THE ANALYSIS OF EXPERIMENTAL KINETIC DATA, by James E. LuValle and Helene Cornelius. Rept. on Contract AF 18(600)371. 15 June 58, 69p. TOI 58-19; AFOSR TN-58-527; AD-158 341.
Order from LC mi $3.90, ph $10.80 PB 135 576

The techniques of analysis of kinetic data are discussed. Practical limitations of these techniques as well as mathematical limitations on the handling of the differential equations involved are pointed out. The application of an analog computer to the analysis

of some model reaction systems is illustrated. It is concluded that the widespread usage of concentration-extent of reaction and rate-extent of reaction curves would be of considerable benefit to investigations in chemical kinetics. These phase plots are much more sensitive to reaction complexity than are the usual concentration-time or integrated plots.

Civil Engineering

Highway Research Board, National Research Council, Washington, D.C.
CORROSION OF REINFORCING STEEL AND REPAIR OF CONCRETE IN A MARINE ENVIRONMENT, by M.W. Gewertz, Bailey Tremper and others. 1958, 47p. 27 refs. Bulletin 182.
Order from NRC* $0.80 NRC-546

Presented at the thirty-sixth annual meeting, 7-11 Jan, 1957.

Contents:
Causes and repair of deterioration to a California bridge due to corrosion of reinforcing steel in a marine environment:
Method of repair, by M.W. Gewertz
Fundamental factors causing corrosion, by Bailey Tremper, John L. Beaton, and R.F. Stratfull.

Highway Research Board, National Research Council, Washington, D.C.
SOIL STABILIZATION STUDIES, 1957. 1958, 53p. 24 refs. Bulletin 183.
Order from NRC* $1.00 NRC-550

Presented at the thirty-sixth annual meeting, Jan 7-11, 1957.

Contents:
Salt stabilization on Ohio's secondary system, by J.W. Reppel
Effect of density on strength of lime-flyash stabilized soil, by R.K. Viskochil, R.L. Handy and D.T. Davidson
The strength characteristics of soil-aggregate mixtures, by Eugene A. Miller and George F. Sowers
Expanded shale as an admixture in lime stabilization, by Raymond F. Dawson and Chester McDowell
Improvement of strength of soil-cement with additives, by T. William Lambe and Za-Chieh Moh

Naval Civil Engineering Research and Evaluation Lab., Port Hueneme, Calif.
ELASTO-PLASTIC RESPONSE OF BEAMS TO DYNAMIC LOADS, by J.R. Allgood and W.A. Shaw. Final rept. Mar 58, 106p. 18 refs. Technical memo. M-130.
Order from LC mi $5.70, ph $16.80 PB 135 000

A study was made to provide and substantiate a simple method for determining the elasto-plastic response of beams subjected to pulse loads. Design charts are presented. The theory is compared with the results of over sixty beam tests.

Princeton U., N.J.
THE EFFECTS OF RESTRAINING BOUNDARIES ON THE PASSIVE RESISTANCE OF SAND (RESULTS OF A SERIES OF TESTS WITH A MEDIUM-SCALE TESTING APPARATUS), by Gregory P. Tschebotarioff and Edmund G. Johnson. Technical progress rept. no. 2 on Contract Nonr-1009(00), Continuation of Contract Nonr-085(00). 1 June 53, 155p. 12 refs. AD-12 607.
Order from LC mi $7.50, ph $24.30 PB 135 236

A medium-scale lateral earth pressure testing apparatus was built to determine the amount of passive resistance that may be mobilized in a granular soil behind a statically loaded structure (a model 2 ft high and 10 ft wide) and to evaluate the frictional effects of the restraining boundaries. The passive pressure tests were run with a dry sand backfill which had a 42^{o} angle of friction. Mobilization of wall friction along the face of a structure may increase the value of the coefficient of passive lateral earth pressure (K_p) by an appreciable amount. Studies were made with a movable wall which was pushed until the limit of passive resistance of the sand behind it was reached for cases in which the wall was either restrained or unrestrained vertically. Tests were also conducted with the wall being pushed downward or upward with simultaneous horizontal loading to make the full amount of available wall friction in either direction effective. K_p will reach a value in the vicinity of 12 when wall friction is fully effective. From 30 to 50% of the total passive resistance was accounted for by shear along the lower horizontal boundary behind the wall. When a granular backfill is required to offer maximum passive resistance behind a wall, the surface of failure curves dowward below the elevation of the bottom of the wall before rising up to the surface at some angle. With tilting of the wall during displacement, an increase or decrease of up to 15% of the total passive resistance takes place. The passive resistance offered by the loose sand was only 35% of that offered by dense sand when the same wall displacement was reached.

Electrical and Electronic Engineering

Naval Ordnance Lab., Corona, Calif.
EVALUATION OF NOLC 15-CHANNEL TRANSISTORIZED ELECTRONIC COMMUTATOR, by T. Burr Jackson. Apr 58, 59p. 3 refs. NOLC rept. 410; NAVORD rept. 5919.
Order from LC mi $3.60, ph $9.30 PB 135 339

Includes Transistorized Time Multiplexer for Telemetering, by J.M. Sacks and E.R. Hill, Technical memo. 73-12.

An evaluation was made of a 15-channel transistored multiplexer designed for use in a new PAM-FM

* National Research Council, 2101 Constitution Ave., N.W., Washington 25, D.C.

telemeter or as a commutator in conjunction with existing systems. Tests were made to determine linearity, sensitivity, zero-signal offset, channel uniformity, and the effects of changes in power supply voltage, signal-source impedance, and output loading. The packaging was designed to minimize the effects of temperature, humidity, vibration, and shock.

Naval Ordnance Lab., White Oak, Md.
INVESTIGATION AND EVALUATION OF AN ELECTRONIC GATE, by Oscar P. Manley. Feb 57, 81p. 18 refs. NAVORD rept. 4335; AD-141 505.
Order from LC mi $4.80, ph $13.80 PB 135 438

A crystal diode gate suitable for sampling accurately small changes in resistance - 0.1% at the level of 10^5 ohms - is investigated. The gate may be a part of a multichannel signal sampling system. It is found that a careful selection of the gate components and reasonable control of the ambient temperature lead to a satisfactory gate performance.

Naval Research Lab., Washington, D.C.
MULTIPLE CHANNEL ELAPSED-TIME RECORDERS OF VOLTAGE AMPLITUDES, by R.K. Royce. Interim rept. 21 Nov 58, 30p. NRL Rept. 5231.
Order from LC mi $3.00, ph $6.30 PB 135 644

Two types of equipment have been developed which will record propagation data in a form permitting direct analysis by statistical techniques. For both equipments, the data recorded represent continuously totalized measurements of the length of time during which the amplitude of an rf voltage remains above various predetermined levels. Thus a distribution of the fluctuation in signal intensity as a function of time can be obtained directly from the recorded data. One type of equipment with seven channels, can be used to measure either signal or atmospheric noise intensities. The operation of the recorder is based upon the division of a 30-db range of signal intensity into seven incremental levels. The length of time during which signal intensity is within a given incremental level is recorded on a clock. By employing two recorders, simultaneous measurements can be made of both signal and atmospheric noise intensities. A second type of equipment has three sets of channels that can be used to record simultaneously signal intensity, atmospheric noise intensity, and the signal-to-noise ratio. Provisions have been included to distinguish automatically between day and night recordings. If the amplitude of the voltage differs significantly between day and night, attenuators can automatically be inserted to shift the range of the recorder accordingly. Except for an increase to ten channels per set, the operation of this equipment is essentially the same as for the seven-channel recorder.

Navy Electronics Lab., San Diego, Calif.
REGULATED POWER SUPPLY ANALYSIS AND DESIGN, by W. Ellis, J.P. Ward, and D.M. Lowe. 4 Mar 57, rev. 10 Jan 58. 103p. Rept. 770(rev); NAVSHIPS 93171.
Order from OTS $2.50 PB 151 121

A careful study of power supplies with the aim of developing a standard series of unitized regulated power supplies has shown that all the characteristics of a regulated power supply may be predetermined by circuit design and/or analysis. The study also showed that few present power supply designs will meet present-day general-use requirements completely. The report presents methods of analyzing and testing power supply characteristics. These methods are intended to serve as a basis for further work in the design of a family of standardized power supplies.

Ohio State U. Research Foundation, Columbus.
COMPARISON OF MOUTH, EAR, AND CONTACT MICROPHONES, by Henry M. Moser, John J. Dreher and others. Technical rept. no. 37 on Contract AF 19(604)1577. Oct 56, rev. Jan 58. 29p. 16 refs. AFCRC TN-56-58; AD-98 820.
Order from LC mi $2.70, ph $4.80 PB 135 069

A first-order-differential noise cancelling microphone (RCA M-33/AIC), and selected ear, throat, and bone transducers were used for comparison studies in various recording and listening conditions. The noise cancelling microphone was used as the control microphone and two simultaneous recordings were made for each of three recording conditions (quiet, 100 db and 111 db noise) for each of the four comparison microphones. The recordings made by trained speakers pronouncing Harvard PB words in quiet and noise were presented to trained listeners in quiet and noise. Under quiet listening conditions the M-33 microphone was generally superior to the other micorphones, although the performance of the ear transducer and the bone oscillator was similar to that of the M-33 under quiet recording conditions. A second experimental study utilized an improved form of the ear transducer and the M-33 microphone. Under quiet listening conditions the performance of the M-33 microphone excelled or equalled that of the ear transducer. In ambient room noise listening conditions, performance of the M-33 was clearly superior. Under conditions of in-line noise the ear transducer was superior or equal to the M-33 for two of the three recording conditions. However, the M-33 was superior to the 115 db noise recording condition.

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
"GREY BOX" METHOD FOR PRECISION FIELD CALIBRATION OF TRANSIENT VOLTAGE MEASURING DEVICES, by S. Ross. Jan 57, 31p. 8 refs. Rept. no. R-1371.
Order from LC mi $3.00, ph $6.30 PB 135 526

A circuit is designed and mathematically analyzed which provides an aperiodic pulse of precision peak amplitude in the range from 0.5 to 1.0 volt, the rise time variable between microseconds and milliseconds.

Polytechnic Inst. of Brooklyn, Mircrowave Research Inst., N.Y.
SIMULTANEOUS GAIN-PHASE APPROXIMATION WITH A POTENTIAL ANALOG COMPUTER, by Paul M. Liebman. Rept. on Contract Nonr-839(05). Aug 57, 84p. 14 refs. Research rept. R-617-57; PIB-545.
Order from LC mi $4.80, ph $13.80 PB 135 097

This report is concerned with the theory and operation of a potential analog computer capable of solving network synthesis problems. The computer may be used for simultaneous amplitude and phase synthesis and the design of All-Pass networks. The device is based on the electro-potential analogy and reduces the problem to one of locating line sources in a conducting medium. The line sources, depending on their polarity, represent the poles and zeros of the function to be approximated.

Radio Corp. of America, Camden, N.J.
UHF LOW-DISTORTION TRANSMITTER, AN/GRT-4. Final rept. on Contract AF 30(602)585. May 55, 141p. RADC TR-56-53; AD-114 379.
Order from LC mi $7.20, ph $22.80 PB 135 240

The purpose of the work described in this report was to develop a UHF Low-Distortion Transmitter, designated AN/GRT-4, to serve as a transmitter for special information requiring a modulation bandwidth of 20,000 cycles with amplitude distortion not exceeding 2 percent at 95-percent modulation. The power output over the UHF range of 225.0 to 399.9 Mc is 100 watts on 1750 channels spaced at 100-kc intervals. The equipment was designed to offer minimum degradation of performance under the extremes of Air Force ground service conditions under which it may operate. Although the equipment was designed for ground service, wherever possible the selection of components followed aircraft radio practice in order to secure maximum reduction in size and weight. In addition, maximum practical ruggedness and reliability were also considered in the final design.

Radio Corp. of America, Harrison, N.J.
DEVELOPMENT OF WAVEGUIDE INPUT LOW-NOISE S-BAND TRAVELING WAVE TUBE, by G. Hodowanec and E. Kinaman. Rept. on Contract AF 19(604)1710; Continuation of Contract AF 19(604)-1140. [1958] 56p. AFCRC TR-57-177; AD-117 095.
Order from LC mi $3.60, ph $9.30 PB 135 496

A waveguide input low-noise TWT, designated as the RCA developmental type A-1077 was developed for use at S-band over the 2.7- to 2.9-kmc band. The A-1077 TWT is an improved version of the A-1038 TWT with waveguide input and coaxial line output. Design objectives indicated a maximum acceptable noise figure (not including coupler losses) of the production design tube at 7.5 db or less and an average tube noise figure falling 0.5 to 1.5 db below this figure. The minimum life for the interim tube on dc life tests was to be 1000 hr. Tube to tube uniformity was sought in such characteristics as gain, operating voltage, and magnetic field requirements. An optimum solenoid-coupler design was sought in which the input coupling was to waveguide and of minimum loss and flat response across the operating band. Test results indicated that the A-1077 tube and waveguide-input package meet all of the objectives. The A-1077 showed an average gain of 25.3 db and an average noise figure of 6.05 db.

Raytheon Mfg. Co., Newton, Mass.
INVESTIGATION OF EMISSIVE MATERIALS FOR ELECTRON TUBES, by Charles Bardsley. Scientific rept. no. 7, 1 Oct-31 Dec 57 on Contract AF 19(604)1822. 3p. AFCRC TN-57-970; AD-133 793.
Order from LC mi $1.80, ph $1.80 PB 135 555

Raytheon Mfg. Co., Newton, Mass.
30 MC SILICON AMPLIFIER (DEVICE 22), by Frank M. Dukat and George Freedman. Final rept. for 1 Jan-30 Oct 57 on Feasibility Study of Diffused Semiconductor Devices, DA-36-039-sc-72710. Sep 57, 42p.
Order from LC mi $3.30, ph $7.80 PB 135 425

Work done on Device 22, the 30 mc silicon amplifier, was proposal of five theoretical geometric designs and experimental activity to attempt to achieve the most promising of these. Fabrication processes are detailed here.

Raytheon Mfg. Co., Waltham, Mass
GASEOUS OR LIQUID FILLING OF MAGNETIC PARTS, by L.F. Kilham, Jr., Ralph R. Ursch, and J. Francis Ahearn. Final development rept. 24 Feb 53-1 Jan 56 on Development of Transformers Utilizing Recently Developed Gases and Liquids, Specifically Fluorochemicals, Contract NObrs-63239. Feb 56. 79p. 37 refs. AD-88 824.
Order from LC mi $4.50, ph $12.30 PB 135 488

Research was conducted to investigate fluorochemical dielectric materials and to develop techniques for their use in transformer design which result in transformers of reduced size and weight. Preliminary studies indicate that the following materials are the most suitable for transformer use: (1) perfluorotributylamine; (2) perfluorodibutylcyclicether; and (3) SF_6 gas. Proposed design techniques include (1) a volatile fluorochemical liquid fill; (2) a combination or tailor-made fluorochemical dielectric coolant; (3) partial fill and use of wicking action of liquid fluorochemicals; (4) liquid and/or gas fluorochemical fill in conjunction with heat-conducting tabs; (5) liquid fluorochemical fill with fluorochemical gas at reduced pressure in the expansion space; and (6) volatile fluorochemical liquid fill with special condensing header.

Rome Air Development Center, Griffiss AFB, N.Y.
EFFECTS OF RATE AND PROLONGED VIEWING OF RADAR SIGNAL FLICKER, by Anthony Debons and Charles Fried. May 58, 15p. RADC TR-58-69; AD-148 730.
Order from LC mi $2.40, ph $3.30 PB 135 311

Indications from the users of certain types of radar scopes in the field suggest that flickering tags may produce deleterious effects. Tags flickering at the rate of 4, 8 and 12 cps were presented on a simulated radar scope to observers for periods up to two hours to determine whether or not prolonged viewing affected observer performance. The findings of the experiment revealed that the lower the flicker rate of the tags the shorter the time required to respond to signals on the scope. With higher rates, variability in performance increased and more time was required to respond to the onset of new signals. At the end of the two hours on the task, no deleterious effects were reported by any of the observers for any of the flicker conditions.

Stanford Electronics Labs., Stanford U., Calif.
CHARACTERISTICS OF POTASSIUM CHROMICYANIDE FOR ZEEMAN TRANSITIONS, by W.S. Chang and A.E. Siegman. Rept. on Contract. AF 33(600)-27784. May 58, 68p. 9 refs. Technical rept. no. 156-1.
Order from LC mi $3.90, ph $10.80 PB 135 310

This report is concerned with the numerical analysis of the characteristics of the $K_3[Cr(CN)_6]$ crystal under Zeeman transitions. These data are important for the design and operation of all maser amplifiers and oscillators using this crystal. The energy level differences determine the operating frequencies of masers, while the matrix elements of the magnetic moment due to the applied r-f fields affect directly their gain, bandwidth, and pumping power. Therefore, an analysis of the Cr^{+++} crystal based on the known spin Hamiltonian plus the numerical results of the energy levels, the eigenvectors, and the matrix elements of the magnetic moments of this crystal are presented here to render guidance in the design of masers.

Stanford Electronics Labs., Stanford U., Calif.
TYPICAL OPERATING CHARACTERISTICS OF TRAVELING-WAVE AMPLIFIERS, by J.R. Arnold. Rept. on Contract DA 36-039-sc-73151. 5 July 57, 25p. Technical rept. no. 503-1; AD-138 005.
Order from LC mi $2.70, ph $4.80 PB 135 278

Empirical data showing the effect of some of the externally variable parameters on the operating characteristics of three typical S-band traveling-wave-tube amplifiers are given. Operating characteristics of a duel-RF-output traveling-wave-tube amplifier are presented for an amplifier with minimum small-signal gain of 20 and 40 db. The difference of input power levels to produce beam saturation at the respective couplers is then 13 db. Measurement of two intermodulation effects in a traveling-wave-tube amplifier is presented graphically.

Stanford Research Inst., Menlo Park, Calif.
A WIDE-BAND STRIP-LINE BALUN, by J.K. Shimizu and E.M.T. Jones. Scientific rept. no. 3 on Contract AF 19(604)1571. June 58, 39p. 7 refs. AFCRC TN-57-753; AD-133 659.
Order from LC mi $3.00, ph $6.30 PB 135 597

A new wide-band strip-line balun that uses a pair of dual coupled-strip-line band-pass filters is described. It can operate over bandwidths up to about 8:1 in the frequency range of about 100 to 10,000 Mc. Design data and theoretical performance curves for typical wide-band baluns of this type are presented. The measured performance of an experimental balun operating over a 3:1 frequency range centered at 3000 Mc is compared with the theoretical performance, and the effects of discontinuities and dissymmetries in the experimental balun are discussed.

Syracuse U. Research Inst., N.Y.
BACK-SCATTERING CROSS SECTION OF AN ANTENNA: PART 3 OF 3. A VARIATIONAL SOLUTION FOR THE INPUT IMPEDANCE OF A YAGI ANTENNA, by Henry J. Juda and Yuch-Ying Hu. Final rept. Oct 54-Oct 56, on Contract AF 30(635)-2808. 31p. Rept. no. EE333-5610F3; RADC-TR-57-78c; AD-131 116.
Order from LC mi $3.00, ph $6.30 PB 135 186

A solution for the input impedance of a two-element Yagi antenna is obtained by using the variational principle. The current trail functions are chosen and the resulting stational y expression for the input impedance is obtained. The solution is applicable for any choice of element lengths and separation and can be extended to any number of elements. Numerical results for a two element case is presented.

Syracuse U. Research Inst., N.Y.
DESIGN OF SHAPED RESPONSE MICROWAVE FILTER, by W.R. LePage and A.T. Villeneuve. Final rept. on. Contract AF 30(602)927. 31 May 56, 106p. SURI rept. no. EE281-566F; RADC TR-56-138; AD-97 867.
Order from LC mi $5.70, ph $16.80 PB 135 376

An array of microwave filters was designed and developed to provide instantaneous frequency indication over the 8000- to 10,000-mc band. The range is covered with cosinusoidal functions of frequency about their center frequencies. The bandwidth of each filter is 220 mc from zero to zero. The filter is composed of cascaded LC-coupled cavities separated by $\lambda/4$ connecting lines. Thin symmetrical rectangular inductive irises made from 0.005-in. brass sheet are inserted between 2 smooth waveguide flanges. The insertion properties follow closely the ideal cosinusoidal variation. Calculations are given which were used in (1) selecting a satisfactory rational approximation function for the ideal cosine response, (2) synthesizing an equivalent lumped constant network with that approximate response function, and (3) determining the relation between the lumped constant network and the microwave cavities. Summaries of alternate approaches are appended.

Tennessee U. Engineering Experiment Station, Knoxville.
ANALYSIS OF THE THERMAL PROPERTIES OF A CIRCULAR ANTENNA ARRAY WITH SYNTHESIS TECHNIQUE FOR OBTAINING A PRESCRIBED RADIATION PATTERN, by W. T. Patton and J. D. Tillman. Scientific rept. no. 2 on Contract AF 19(604)1557. June 58, 67p. AFCRC TN-58-148; AD-152 379.
Order from LC mi $3.90, ph $10.80 PB 135 206

In this report the input impedances at the base terminals of antennas in a circular array are analyzed by the method of matrix analysis. In order to reduce the wide variations in input impedance produced by mutual coupling between elements of the array, the characteristic equation is solved for the characteristic impedances and characteristic currents of the antenna system.

Waltham Electronics Corp., Mass.
A DEVELOPMENT PROGRAM TO FURTHER TECHNIQUES BY WHICH RADAR DATA PROCESSING SYSTEMS MAY BE EVALUATED. Final rept. on Contract AF 19(604)2141. 31 Mar 58, 71p. AFCRC TR-58-152; AD-152 424.
Order from LC mi $4.50, ph $12.30 PB 135 618

The development of a Digital Track Generator which converts numbers on a punched paper tape corresponding to the Cartesian coordinates of a radar target to two D.C. voltages with an accuracy of 0.01% has been accomplished and is described. An analogue Track Generator has been designed and constructed that generates a radar target track which can hold a full scale circle to within 1.% for one hour. A commutator made of conducting plastic has been designed and tested.

Air Force Armament Center, Eglin AFB, Fla.
PRECISION DETERMINATIONS OF A-C VOLTAGE RATIOS, by Andre Medvedeff. Armament test report. Aug 57, 33p. AFAC TR-57-72; AD-128 060.
Order from LC mi $3.00, ph $6.30 PB 135 390

Descriptions are presented of three methods for the calibration of an inflight calibrator developed for use with airborne oscillograph recording systems. The first method determines d-c resistances established in the inflight calibrator to ±0.01% accuracy. The second method, made possible by local development of a high impedance voltmeter, measures absolute voltages to ±0.1% accuracy, from which resistances of the inflight calibrator components are calculated. The third method utilizes a powerful null system for measuring these alternating voltages directly to accuracies of ±0.05%. While it was proved that the third method is the most suitable for the primary purpose of this task, the other two methods are described in detail for their possible applications to other problems.

Air Force Cambridge Research Center, Bedford, Mass.
ELECTRONIC SCANNING SYMPOSIUM (UNCLASSIFIED SECTION) HELD AT AIR FORCE CAMBRIDGE RESEARCH CENTER, 29-30 APRIL-1 MAY 1958. lv. AFCRC TR-58-145(1); AD-152 409.
Order from LC mi $11.10, ph $42.60
PB 135 598

Contents:
Electronic scanning--past and future, by Robert M. Barrett
Mutual impedance effects in large electronic beam scanning arrays, by Philip S. Carter, Jr.
The effects of mutual coupling on the scanning of 2 dimensional arrays, by S. Edelberg
The effect of mutual impedance in electronically scanned antenna arrays, by L. A. Kurtz and R. S. Elliott
Spiral antennas applied to scanning arrays, by J. A. Kaiser
A new Eagle-type scanner, by D. M. Bowie and G. G. Chadwick
Precise control of ferrite phase shifters, by D. D. King and others
Gaseous electronic microwave phase shifter employing electron cyclotron resonance, by F. A. Olson and others
Gaseous electronic scanners, by R. S. Jones and G. R. Lowrey
Description of a novel type of low frequency radar antenna and an analysis of its signal to noise performance, by Stanley Rush

Airtron, Inc., Linden, N.J.
EXPANSIBLE WAVEGUIDE, by J. W. Hamilton, T. N. Anderson and others. Final Engineering rept. for 10 Apr-20 July 56 on Contract NObrs-64703. 27 July 56, 16p. AD-116 841.
Order from LC mi $2.40, ph $3.30 PB 135 245

The purpose of this report is to review all the phases leading to the final development of an expansible waveguide assembly in the RG 109/U size (2.840" x 1.004") in accordance with the requirements as outlined in Bureau of Ships Specification #SHIPS-W-1753.

Army Signal Engineering Labs,, Fort Monmouth, N.J.
MULTIPOLE SEPARATOR FOR MASERS, by F.O. Vonbun. Apr 57, 25p. 8 refs. Engineering rept. no. E-1203.
Order from LC mi $2.70, ph $4.80 PB135 528

A Maser is an apparatus utilizing a molecular beam in which molecules in the excited state of a microwave transition are selected and than directed into a microwave cavity. In this report a device is described that is used to select and at the same time, to focus molecules in certain quantum states.

Battelle Memorial Inst., Columbus, Ohio.
COMPONENT EVALUATION AND SPECIFICATION ENGINEERING TEST DATA ON TASK XIII. RESISTORS FIXED ACCURATE WIREWOUND. VOL. I.

Data taken 1 May 54-1 July 55 covering the products of the following manufacturers AF-AH and AK-AM, Contract no. DA[36]-039-sc-63136. [1955] [188]p. AD-115 644.
Order from LC mi $8.40, enl. pr. $30.30 PB 136 681

Battelle Memorial Inst., Columbus, Ohio.
COMPONENT EVALUATION AND SPECIFICATION ENGINEERING TEST DATA ON TASK XIII. RESISTORS FIXED ACCURATE WIREWOUND. VOL. II. Data taken 1 May 54-1 July 55 covering the products of the following manufacturers AF-Ah and AK-AM, Contract DA 36-039-sc-63136. [1955] [149]p. AD-115 645.
Order from LC mi $7.20, enl. pr. $24.30 PB 135 682

Bogue Electric Mfg. Co., Paterson, N.J.
SEMICONDUCTOR DEVICE SET MX-2009(XW-1)/GP. Final engineering rept. on Contract AF 30(602)1575. 15 May 57, 10p. RADC TR-57-113; AD-131 162.
Order from LC mi $1.80, ph $1.80 PB 135 288

This final report covers the development of a high voltage 3 phase bridge silicon power rectifier assembly capable of fulfilling the function of 6 high voltage vacuum tube rectifiers in a DC power supply. Design, criteria, component selection, testing and other problems are described in the body of the report.

Chicago U., Ill.
TOPOLOGICAL NETWORK THEORY, by A. Nerode and H. Shank. Final rept. on Linear Network Analysis, Contract AF 33(616)2797. Nov 57, 34p. 20 refs. WADC Technical rept. 57-424; AD-155 730.
Order from OTS $1.00 PB 151 416

Methods of linear algebra and combinatory topology are applied to yield precise versions of certain portions of electrical network theory. Those portions deal primarily with the existence and uniqueness of currents in resistive networks and in passive lumped parameter networks and with the determination of such currents by rigorous algorithms.

Dunlap and Associates, Inc., Stamford, Conn.
DETECTION OF AIRCRAFT BY RADARS SUBJECTED TO RADIO INTERFERENCE, by John D. Coakley. Final rept. on Contract DA 36-039-sc-64647. May 57, 18p. AD-135 075.
Order from LC mi $2.40, ph $3.30 PB 135 736

The purpose of this memorandum is to examine some of the consequences of radio interference for the operator. By knowing what these consequences are one can be prepared to understand the penalties for not adequately solving interference problems. The principal conclusion to be reached is that the penalties of letting an operator cope with the results of radio interference are sometimes much greater than design engineers recognize.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
SEPARATE CHANNEL AVERAGING IN A MATCHED TWIN-CHANNEL RADIO DIRECTION FINDER, by A.D. Bailey and A.J. Wavering. Technical rept. no. 8 on Contract Nonr-1834(02). June 57, 35p. 6 refs.
Order from LC mi $3.00, ph $6.30 PB 135 119

Extension of paper with same title presented at the 1956 National Electronics Conference.

It is suggested and shown in this report that if one first properly samples and averages the data of the separate channels, the need for the bearing shifter is eliminated. It is shown theoretically that the Separate Channel Averaging System contributes the same order of error due to wave interference as existing systems, provided certain conditions are satisfied.

Electronics Research Lab., U. of California, Berkeley.
A FERRITE ROD ANTENNA, by A.B. Johnson and D.J. Angelakos. Rept. on Contract N7onr-295(29). 13 Aug 57, 25p. 7 refs. Rept. no. 71; IER Series no. 60, Issue no. 192; AD-153 735.
Order from LC mi $2.70, ph $4.80 PB 135 099

The radiation characteristics at X-band of a ferrite rod antenna are studied. The antenna consists of a ferrite rod supported axially in a circular wave guide which is terminated in an infinate ground plane. The rod extends out of the wave guide above the ground plane. Radiation patterns as a function of d.c. biasing magnetic field on the ferrite are shown for both linearly and circularly polarized energy propagating in the TE_{11} mode in a circular wave guide and continuing on the extending ferrite rod.

F-R Machine Works, Inc., Woodside, N.Y.
BROADBAND RIDGED WAVEGUIDE COMPONENTS, by Leonard I. Kent. Final rept. for 10 Nov 55-10 Oct 56, on Contract AF 30(602)1426. 62p. Rept. no. 2871; RADC TR-57-36; AD-114 290.
Order from LC mi $3.90, ph $10.80 PB 135 120

Designs are presented of experimental models of broadband ridged waveguide components which were developed for the 1- to 4-kmc range. The experimental models consisted of slotted sections; ridged-to-rectangular adapters for the RG-48/U, RG-69/U, and RG-104/U waveguides; matched terminations; waveguide-to-coaxial adapters; tunable crystal-bolometer mounts; slide-screw tuners; directional couplers; variable precision attenuators; and single-to-double ridged waveguide adapters. The performance of all components is satisfactory and meets specifications.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
STUDY PROGRAM FOR INVESTIGATION TO AID IN REDUCTION AND PREVENTION OF UHF INTERFERENCE, by Robert E. Meek, Howard L. McKinley and others. Final rept. on Contract AF 30(602)673. Nov 56, 116p. RADC TR-57-45; AD-114 319.
Order from LC mi $6.00, ph $18.30 PB 135 260

The origin and methods for reducing interference generated within UHF multichannel communication equipments such as the AN/ARC-27 are outlined in this report. The principal types of interference encountered were (1) intermodulation from the action of the nonlinearities in the early stages of the receiver and (2) spurious signal generation from the local spectrum-generator system. Nonlinearities considered were those found in the UHF amplifier tubes and first mixer tube.

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
SELF-ADJUSTING CONTROL SYSTEM, by Robert R. Bairnsfather. Master's thesis. Rept. on Contract AF 33(616)2698. May 56, 53p. 7 refs. Rept. T-102.
Order from LC mi $3.60, ph $9.30 PB 135 698

The application of a self-adjusting procedure to a control system with Gaussian random inputs and subject to limiting is considered. A self-adjusting control system is defined as a feed-back control system which is capable of adjusting its own compensation (by means of an external computer) in accordance with some criterion, here assumed to be the minimization of the system mean-square error. The purpose of such adjustment is to provide partial compensation for variation in the parameters of the controlled component and for variations in the statistics of the input.

Kawneer Co., Niles, Mich.
DESIGN STUDY FOR A TAC MODULAR SHELTER, by E. J. Alyanak. Final rept. on Contract AF 30(602)1521. Sep 57, 72p. (1 color diagr. will not reproduce). RADC TR-58-17; AD-148 586.
Order from LC mi $4.50, ph $12.30 PB 137 104

This report presents the results of a design study for a modular shelter suitable for a wide range of climatic conditions. A watershedding pitched roof and lap joints are employed to provide weathering capabilities. Internal structure with a pre-assembled, folding truss permits use of fasteners operable from inside of the building, free from effects of climatic conditions. In addition, the interior structural elements provide an efficient anchor for routing of utilities and mounting of equipment. The system of structural panels, beams and columns may be arranged to provide a variation in building size in 8 foot increments to a maximum width of 32 feet and in any length. Buildings may be erected with a complete foundation and floor system on unprepared sites when a structurally independent floor may be desired.

Mallory, P. R., and Co., Inc., Indianapolis, Ind.
INVESTIGATION OF PRINTED CIRCUIT METHODS FOR RELAY APPLICATIONS, by Howard R. Reeve and Robert L. Traas. Rept. for 15 June 55-31 June 57 on Improved Electronic Components, Contract AF 33(616)3044. Aug 58, 221p. 6 refs. WADC Technical rept. 57-701; AD-155 837.
Order from OTS $3.50 PB 151 259

This report covers the research leading to and the development of a novel relay design which is applicable to low cost production and is adaptable to automatic fabrication. Three basic designs and a total of nine modifications resulted in a final relay which exhibits simplicity, flexibility, and dependability. Actuation methods considered included: electrostatic, piezoelectric, magnetostrictive, thermal, electron tubes, semiconductor, electrostrictive, and electromagnetic. The latter was chosen as the most practicable. Early design models incorporated six-pole-double-throw sets of contacts, but further development led to a more compact single-pole-double-throw relay which could be used in multiple to provide additional poles as required. The unique features of the final design relay are: the utilization of a Cunife permanent magnet to retain the contacts in the normally closed position, thereby eliminating the spring return normally employed; and the utilization of the armature for both the actuating and the contacting member. The magnetic pole-pieces are also multiple purpose units in that they comprise the normally open and normally closed contacts. This relay is hermetically sealed, occupies a volume of 0.249 in., weighs 0.576 ounces, requires less than 0.200 watt operating power, and operates satisfactorily in an ambient temperature range from -65°C to 125°C. Although some deficiencies were noted during final tests, performance tests demonstrated effectively that the basic design features employed were entirely feasible for a low-cost, dependable, high-speed relay.

Microwave Lab., Stanford U., Calif.
ELECTROFORMING OF LINEAR ACCELERATOR STRUCTURES, by James A. Pope. Technical rept. on Contract Nonr-225(06). June 57, 22p. M.L. rept. no. 398,
Order from OTS $0.75 PB 131 944

This report covers the equipment and techniques for the electroforming of copper linear electron accelerator structures. Electroforming allows baking of the structure at high temperatures for purposes of outgassing and subsequent sealing-off of the vacuum-tight accelerator tube, and also offers the advantage of a stress-free final structure. Other advantages are: (1) the ability to fabricate long accelerator sections with good accuracy (five feet is the maximum length electroformed to date but a 10-ft length is considered feasible); and (2) the relative ease of fabricating accelerator structures of nonuniform dimensions.

Chrysler Corp. Missile Operations, Detroit, Mich.
TACTICAL HANDLING SYSTEM FOR THE ST-80 STABILIZED PLATFORM, by R.O. Wyne. Technical rept. on Field Artillery Guided Missile System Redstone, Contract DA 20-018-ORD-14800. 27 Mar 57, 11p. Rept. no. GC-R1; AD-134 093.
Order from LC mi $2.40, ph $3.30 PB 134 318

This report presents an installation sequence of the ST-80 stabilized platform (into the REDSTONE missile tactical body) under field conditions, and provides information for an ST-80 platform tactical handling system design.

Naval Ordnance Test Station, China Lake, Calif.
INFRARED SPECTROPHOTOMETRIC DETERMINATION OF NITROSTARCH IN XC-9 INITIATION MIXTURE, by Aaron N. Fletcher. July 57, 19p. 2 refs. NOTS-1780; NAVORD rept. 5580.
Order from LC mi $2.40, ph $3.30 PB 135 135

An infrared spectrophotometric method has been developed for the determination of nitrostarch in the supernatent liquid of XC-9 initiation mixture. The liquid sample is filtered and evaporated to dryness. Acetone is added and the absorbance at 11.8μ is determined. An iterative or a quadratic method is used to calculate the amount of nitrostarch present. The precision is reflected by a percent coefficient of variation of 0.4. The accuracy is calculated to be within ±4.5% of the amount present for a nominal composition of 2.72 g of nitrostarch per 100 g of solvent.

Naval Powder Factory, Indian Head, Md.
OXIDATION INDUCED BY SHOCK WAVES IN A POLYURETHANE-AMMONIUM PERCHLORATE SYSTEM, by F.A.H. Rice and D. Levine. June 58, 14p. 7 refs. Research paper 22-57.
Order from LC mi $2.40, ph $3.30 PB 135 091

A mixture of polyurethane and ammonium perchlorate as used for propellants, was cut into blocks, subjected to a shock wave from a plane-wave generator, and the concentration of perchlorate, chlorate, and ammonium ions in the propellant was determined at various distances from entering shock wave. Results indicated that the concentration of perchlorate decreased as a consequence of the passage of the shock wave and that this decrease in concentration depended on the intensity of the shock wave.

Naval Proving Ground, Dahlgren, Va.
IMPROVED METALLOGRAPHIC TECHNIQUE FOR REVEALING TEMPER BRITTLENESS NETWORK IN ORDNANCE STEELS, By J.P. Rucker. Aug 57, 32p. 10 refs. NPG rept. no. 1555.
Order from OTS $1.00 PB 131 941

A modified zephiran chloride solution has been developed which is superior to the standard zephiran chloride etchant in that it gives sharper detail of the network and microstructure. A combination etch (zephiran chloride, followed by 5% nital) also was developed which saves considerable time in metallographic preparation and analysis in determining the presence of free ferrite, tempered martensite and network.

Picatinny Arsenal, Dover, N.J.
QUALIFICATION OF DESENSITIZING WAXES BASED ON TESTING OF PILOT BATCHES OF EXPLOSIVES, by J.A. Cussen. June 58, 12p. Technical rept. DB-TR: 6-58.
Order from LC mi $2.40, ph $3.30 PB 135 538

Springfield Armory, Mass.
PHOTOELASTIC DETERMINATION OF STRESS DISTRIBUTION IN CHAMBER SECTIONS OF EXPERIMENTAL GUNS, by D.E. Kuhn and R.K. Steele. Nov 57, 79p. 3 refs. SA-TR 20-2805.
Order from LC mi $4.50, ph $12.30 PB 135 529

Photoelastic stress analysis equipment is described and several typical examples of its application to multi-chamber and single-chamber 20mm weapon designs are presented. These applications cover the preparation of plastic models of sections of proposed experimental chambers, the simulation of prototype loads by special mechanical and pneumatic methods, and the calculation of principal stresses from an analysis of recorded photoelastic patterns. It is felt that the constant pressure hydrostatic loading fixtures has merit.

FOOD, HANDLING, AND PACKAGING EQUIPMENT

California Agricultural Experiment Station, Davis.
CHEMICAL CONTROL OF MICROORGANISMS IN DEHYDRATED VEGETABLES, by Reese H. Vaughn and George K. York II. Rept. no. 1 (Final), 31 Mar 55 - 31 Mar 56, and Suppl. 1 Apr - 30 Sep 56, on Contract DA 19-129-qm-323. Sep 56, 27p. 15 refs.
Order from OTS $0.75 PB 131 953

The following compounds have been used in a study of chemical control of microbial populations of unbalanced dehydrated vegetables: sorbic acid, sulfur dioxide, peracetic acid, penicillin, dehydrostreptomycin, polymyxin B, and aureomycin. All of these compounds caused a significant reduction in the "total" count of the finished product (garlic, onions, and celery).

California U., Los Angeles.
EFFECT OF IONIZING RADIATIONS ON THE NUTRITIVE AND SAFETY CHARACTERISTICS OF FOODSTUFFS, by J. F. Mead. Rept. no. 10 (Final), 28 Jan 55-31 Dec 56 on Contract DA 19-129-qm-265. Jan 57, 22p. 25 refs.
Order from OTS $0.75 PB 131 951

The effects were investigated of temperature and time of storage following irradiation on the peroxide content of natural fats and oils and on pure unsaturated fatty esters. The chemical changes that occured during irradiation in model systems of simple hydroperoxides and conjugated unsaturated fatty esters were also investigated.

Massachusetts Inst. of Tech., Cambridge.
DEVELOPMENT OF A METHOD OF RADIATION STERILIZATION OF FOOD WITHOUT ADVERSE FLAVOR AND CHEMICAL CHANGES, by B. E. Proctor. Rept. no. 11 (Final), 1 Sep 55-20 Apr 57 on Contract DA 19-129-qm-521. May 57, 135p.
Order from OTS $2.75 PB 131 957

Storage studies of a number of irradiated foods held at various temperatures ranging from 50° to 125°F were terminated. The foods included chicken meat, green beans, halibut, hamburg, pork sausage, scallops, spinach and sweet potatoes. A graphical representation of flavor score, as a function of storage times at the various temperatures, made it possible to estimate the shelf life at the various temperatures. In general, it can be stated that at 68° or 50°F the storage life was 10 mo, and possibly longer, at 99°F it was between 2 to 4 mo, and at 125°F the storage life was 1 mo or less.

Massachusetts U., Amherst.
EFFECT OF IRRADIATION ON PIGMENTED FOODS USED IN RATIONS FOR THE ARMED FORCES, by I. S. Fagerson. Rept. no. 5 (Final), 1 June 55-31 May 56 on Contract DA 19-129-qm-321. June 56, 32p.
Order form OTS $1.00 PB 131 952

This work was directed at determining an effect on plant pigments using irradiation dosages of approximately 132,000 reps. For this work, an acetone-hexane solution of beta-carotene, a carrot puree, an aqueous solution of pelargonidin, and a strawberry jelly were used.

Midwest Research Inst., Kansas City, Mo.
STUDY OF CHEMICAL ADDITIVES FOR FOOD TO PREVENT DAMAGE DURING RADIATION STERILIZATION, by R. W. Shortridge. Rept. no. 14(Final), 24 June 55-23 July 57 on Contract DA 19-129-qm-472. July 57, 42p.
Order from OTS $1.25 PB 131 956

Samples of 10 different foods were irradiated, half of the samples containing one of 55 additives and half being without additive. A panel evaluated the odors of the raw foods as to whether there was a difference between the sample with additive and the sample without additive, and as to which odor was preferred. This procedure was repeated until all 55 additives had been tested. A total of 19 of the additives were tested further; these additives were selected because they had caused extremely significant odor differentiation in the first phase, along with no significant decrease in preference or acceptability. The range of foods was narrowed to 4: hamburger, haddock, corn, and lima beans; all foods were cooked as appetizingly as possible. All 4 combinations of presence or absence of additive and of irradiation were tasted in 2-sample preference tests by the Midwest Research Institute staff as a large untrained panel. During the course of this phase, 3 appreciable modifications were made: (1) the irradiation level, originally 2.25 megareps was raised first to 3.0 and finally to 6.0 megareps to assure adequate damage to the hamburger; (2) the last 17 experiments were run on hamburger alone, to allow increasing the total number of additives tested, and (3) a number of additives, particularly gaseous ones, were tested in addition to the ones on the original list from the first phase. None of the many additives tested gave any significant protection of hamburger against development of irradiation off-flavor. Additives tested upon the other 3 foods on the list were equally ineffective as regards these foods.

Ohio State U. Research Foundation, Columbus.
CHEMICAL AND ORGANOLEPTIC CHANGES IN CARBOHYDRATES AND PROTEINS PRODUCED BY RADIATION STERILIZATION, by M. L. Wolfrom, T. M. Han and others. Rept. no. 6 (Final) on Contract DA 19-129-qm-515. May 57, 82p.
Order from OTS $2.25 PB 131 967

The effect of ionizing radiations on the hexitols D-mannitol and D-glucitol was studied by paper chromatographic and isolative techniques. An investigation of the relative susceptibilities of alpha and beta glycosidic linkages to ionizing radiations was initiated. This work indicates the hydrolysis of maltose to glucose by the action of ionizing radiation. Preliminary work on the action of ionizing radiations on inulin indicated that, at the usual sterilization dose, inulin is not degraded to fructose.

The effects of cathode rays on various starches are reported. The cathode ray irradiation of powdered sucrose at ambient temperature was reinvestigated. A comparative study of the effects of cathode rays and soft X-rays on aqueous sucrose (50%) at ambient air and ethanol-solid carbon dioxide temperature is presented. The fractional crystallization of irradiated aqueous D-fructose yielded three crystalline fractions. The effect of cathode rays on pure and dilute aqueous solutions of ethylene glycol was investigated.

Ohio State U. Research Foundation, Columbus.
STUDY OF THE PHYSICAL-CHEMICAL CHANGES OF PROTEINS WHICH OCCUR DURING MILK DEHYDRATION WHICH AFFECT THE ACCEPTANCE OF THE MILK AS A BEVERAGE, by I. A. Gould. Rept. 7 (Final) 1 Apr 55-31 May 56 on Contract DA 19-129-qm-267. June 56, 95p. 16 refs. RF Proj. 629.
Order from LC mi$3.30, ph$7.80 PB 135 449

The objectives of this study were to determine the physical-chemical changes which had been produced in a sample of milk powder, and to find equivalent conditions of heating of milk which would produce like changes in its physical-chemical properties. By varying the intensity of heat treatment about this equivalent value, the range of heat treatment, if any, producing equivalent conditions and the rate of change in the electrophoretic properties of the protein system of milk with change in the intensity of heat treatment could be found.

Oregon State Coll. Agricultural Experiment Station, Corvallis.
CORRELATION IN RADIATION STERILIZED FOODS OF THE CHEMICAL CHANGES ASSOCIATED WITH THE CHARACTERISTIC FLAVOR DEVELOPMENT, by H. W. Schultz. Rept. no. 9 (Final), 22 Apr 55-30 June 56 on Contract DA 19-12-qm-407. July 56, 14p.
Order from OTS $0.50 PB 131 948

Irradiated and control meats were evaluated for flavor and analyzed for TBA, peroxide, and fluorescent values. The results have given a good indication that a chemical test can be devised which will be an indicator of the characteristic flavor depression associated with irradiated foods.

Oregon State Coll. Agricultural Experiment Station, Corvallis.
INCREASING THE ACCEPTANCE OF IRRADIATED MEAT AND MEAT PRODUCTS BY SELECTED TREATMENTS BEFORE, DURING AND FOLLOWING IRRADIATION, by H. W. Schultz. Rept. no. 8 (Final), 23 Oct 55-31 Dec 56 on Contract DA 19-129-qm-554. Jan 57, 61p.
Order from OTS $1.75 PB 131 958

The general objective has been evaluation of the effect of combination treatments (coupled with radiation) on the acceptability of meats. Treatments used were prior heat, concomitant heat, and antibiotics applied to a specific meat product or to a prepared meat product. The acceptance of irradiated fresh meats have been evaluated over extended storage periods.

Stanford Research Inst., Menlo Park, Calif.
COMPARATIVE STUDY OF THE EFFECTS OF HIGH AND LOW INTENSITY RADIATIONS IN FOOD STERILIZATION, by S. I. Taimuty. Rept. no. 9 (Final), 1 June 55-31 Aug 57 on Contract DA 19-129-qm-429. Sep 57, 61p. 9 refs.
Order from OTS $1.75 PB 131 955

The comparative effects of high and low intensity radiation on organoleptic changes in foods, bactericidal efficiency, and nutrient destruction were studied. The foods studied were powdered milk, strawberries, white bread, fresh peas, fresh stringbeans, shrimp, sirloin steak, ground round steak, smoked ham, and bacon.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Southwest Research Inst., San Antonio, Tex.
SURVEY AND ANALYSIS OF ORDNANCE STORAGE BATTERY PERFORMANCE AT EXTREME LOW TEMPERATURE, by Walter K. Morris. Rept. on DA 23-072-ORD-836, TO-3. Dec 55, 139p.
Order from OTS $2.75 PB 131 845

An analysis of the literature previously reported in monthly progress reports is presented. Based on this analysis, the best approach to the low-temperature storage battery problem is presented in the report recommendations.

Engines and Propulsion Systems

Arnold Engineering Development Center, Tullahoma, Tenn.
METHODS OF REMOVING BORON OXIDE PARTICLES FROM EXHAUST GASES, by LeRoy J. David, R. P. Rhodes, and F. H. Smith. Rept. on Contract AF 40(600)700, AEDC TN-57-17; AD-135 346. Oct 57, 25p.
Order from LC mi$2.70, ph$4.80 PB 135 391

A removal efficiency of 85% was determined to exist at the water-air ratio of 30:1 for coarse spray scrubbing alone. Steam injection resulted in a removal efficiency of 93% at a steam-air ratio of 0.3:1. Water injection used in conjuction with coarse sprays resulted in a removal efficiency of 97%. The data verified indication of previous tests that erosion by burner-generated oxides would not be significant. A test blade of brass showed no apparent erosion after 25 hr of exposure to the combustion products of trimethyl borate azeotrope.

James Forrestal Research Center, Princeton U., N.J.
PROJECT SQUID SEMI-ANNUAL PROGRESS REPT. 1 OCTOBER 1956 TO 1 APRIL 1957. CONTRACT N6ori-105, TASK ORDER III. Apr 57, 138p.
Order from LC mi$6.90, ph$21.30 PB 135 480

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Michigan U., Ann Arbor.
HIGH-TEMPERATURE PROPERTIES OF FOUR LOW-ALLOY STEELS FOR JET-ENGINE TURBINE WHEELS, by Arthur Zonder, Adron I. Rush, and James W. Freeman. Rept on High-Temperature Alloys, Contract AF 33(038)13496, WADC Technical rept. 58-277, pt. 1; AD-26 290. Nov 53, 77p.
Order from LC mi$4.50, ph$12.30 PB 135 130

Properties at 1000°, 1100°, and 1200°F are reported for jet-engine turbine wheels made from four low-alloy hardenable steels. The steels were SAE 4340, 1.25 Cr-Mo-Si-V ('17-22A'S), 3 Cr-Mo-W-V(H-40), and 12 Cr-Mo-W-V (C-422). The wheels were contour forged from commercial heats. Wheels of each alloy were heat treated by normalizing, oil quenching, and by an interrupted quench. All were tempered to an aim hardness of 280 to 320 Brinell. There was very little difference in strength between the alloys for the wheels with the best heat treatment at short time periods. The 4340 steel fell off rapidly in strength with time. The '17-22A'S steel had the highest strength at 1000°F, but fell off with time at 1100° and 1200°F. The H-40 and C-422 steels maintained their strength better with time and temperature. Heat treatments which produced intermediate transformation products in the structures of the steels resulted in highest strength, except for C-422 alloy. The latter 12 Cr alloy could not be heat treated to such structures. The treatments producing the best properties were normalizing for 4340 steel, oil quenching for '17-22A'S steel, oil quenching for H-40, and oil quenching for C-422 alloy.

National Bureau of Standards, Washington, D.C.
DEVELOPMENT OF EROSION-RESISTANT COATINGS FOR AIRCRAFT ENGINE COMPONENTS, by A. G. Eubanks and D. G. Moore. Rept. on Ceramic Coatings, Contract AF 33(616)552. Jan 56, 41p. WADC Technical rept. 56-129; AD-101 730.
Order from LC mi$3.30, ph$7.80 PB 135 543

Specimens of uncoated Inconel and 17-22-AS low-alloy steel and of these 2 alloys coated with cermet M-60 and ceramic coatings A-19H and A-418 were subjected to 2 different test procedures to determine their erosion resistance at 80°, 1050°, 1400°, 1650°, and 1800°F. One test procedure consisted of subjecting the specimen, in a furnace, to a succession of 10-sec blasts of preheated air (velocity 340 fps) which contained a fixed amount of 20- to 100-mesh glass sand and determining the number of blasts required to remove 0.001 in. of material from the surface of the specimen. The second test procedure consisted of passing the specimen through a sonic velocity flame containing a fired quantity of potter's flint (2-μ average diameter) and determining the number of passes necessary to remove 0.001 in. of surface thickness. Uncoated Inconel had the best erosion resistance except at temperatures above 1650°F where the resistance of the M-60 coating was higher. Both tests indicated that the erosion resistance of uncoated alloys decreases with increasing temperature but that the erosion resistance of the cermet and ceramic coatings increases after a certain critical temperature is reached for each coating. The ceramic coatings (A-418 and A-19H) exhibited poor resistance to the test conditions below the temperatures at which they softened. In a series of tests designed to improve the erosion resistance of ceramic and cermet coatings, a composition containing CrB in a matrix of Cr, B, and Ni was about twice as resistant as uncoated Inconel at 1800°F but less resistant than Inconel at temperatures below 1600°F.

Princeton U., N.J.
COMBUSTION INSTABILITY IN LIQUID PROPELLANT ROCKET MOTORS, by F. Hilliard. Quarterly progress rept. no. 16, 1 Feb-30 Apr 56, on Contract NOas 53-817-c. June 56, 29p. Aeronautical Engineering Rept. No. 216-p.
Order from LC mi$2.70, ph$4.80 PB 135 433

Propulsion Research Corp., Santa Monica, Calif.
ANALYTICAL COMPARISON STUDY OF THE PRC WAVE ENGINE AND SOME COMPETITIVE AIR-BREATHING ENGINES. Rept. on Contract AF 18(603)77. Jan 58, 53p. PRC R-280; AFOSR TR-58-36; AD-152 245.
Order from LC mi$3.60, ph$9.30 PB 135 402

The performance of the PRC wave engine has been calculated and has been compared with those of two turbojets and a ramjet. It is concluded that the

PRC wave engine does not have a lower specific fuel consumption than existing competitive engines. The thrust per frontal area for the wave engine in supersonic flight was found to be about one-third of the value for a turbojet with afterburner.

Rocketdyne, Canoga Park, Calif.
ROCKET EXHAUST CORROSION SIMULATOR, by Frank B. Cramer. Rept. for Dec 55-Aug 57 on Finishes and Materials Preservation, Contract AF 33(616)3165. Aug 57, 131p. 66 refs. WADC Technical Rept. 57-379; AD-155 762.
Order form OTS $2.75 PB 151 273

Techniques for studying the corrosive effects of rocket exhaust gases upon various material surfaces have been developed. The designs of the recommended items of test equipment and the methods for executing these procedures are presented. This study was initiated with an analysis of the problem areas: namely, sampling of the hot, high velocity rocket exhaust gases, uniform "simultaneous" exposure of a statistically adequate number of specimens, adequate development of corrosion, evaluation of the corrosion damage on the specimens and statistical evaluation of the utility of the techniques and equipment. Designs were developed and checked out for a device capable of providing uniform exposure of large numbers of specimens to a single firing of a solid propellant charge. One design is presented for a laboratory device to burn small quantities (one pound) of propellants under very low hazard conditions. Another design was presented for a device capable of uniformly exposing 72 specimens to multiple samples of the hot, high velocity exhaust gases of an aircraft armament rocket. An evaluation of the extent of corrosion damage to specimens examined by the techniques described in this report showed: that exposure was uniform from specimen to specimen, that differences could be compared statistically with propellant burned in a laboratory burner, and that specimens exposed to rocket exhausts during airflight could be qualitatively compared to the specimens exposed to propellants burned in the laboratory style test fixture.

Southwest Research Inst., San Antonio, Tex.
CORRELATION OF THE FACTORS WHICH AFFECT VAPOR LOCK IN AUTOMOTIVE FUEL SYSTEMS, by R. L. Cappel. Rept. on Contract DA 23-072-ORD-836, TO-1. Nov 54, 112p. 269 refs. AD-75574.
Order from OTS $2.50 PB 131 843

Through analyses of the available literature, a systematic presentation of the many factors which affect vapor lock in automotive equipment has been made. Fuel characteristics, climate, and fuel system design are shown to be the fundamental factors in the problem of vapor formation in fuel systems. An annotated bibliography is provided for the literature reviewed, and is divided into civilian articles, CRC reports, and reports from military sources.

Manufacturing Equipment and Processes

Bureau of Ships, Washington, D.C.
RADIOGRAPHIC STANDARDS FOR BRONZE CASTINGS FOR RADIUM COBALT (60) AND HIGH VOLTAGE X-RAYS (1000 kvp AND OVER). June 58, 10p. 19 radiographs. NAVSHIPS 250-537-2.
Order from OTS $25.00 PB 151 351

The standards in this compilation are based on the present state of knowledge and practices as applied to tin bronze castings and are applicable in accordance with specifications of the Contracting Agency or Bureau concerned. These standards are to be used for comparison with radiographs from actual castings. The radiographs in this set represent sections of gun metal bronze plates (specification MIL-M-16576) which were cast 3/4 in. thick. They are considered applicable to thicknesses as follows:

Radiation source	Thickness range
Radium	1-3/4 to 2 in.
Cobalt 60	1 to 2 in.
X-rays 1000 kvp and over	0 to 2 in.

The standard radiographs are grouped into five types according to discontinuity as follows: Type 1-Gas Porosity; Type 2-Shrinkage; Type 3-Sand Inclusions; Type 4-Chaplets; Type 5-Tears. Each of the first three types contains five degrees of severity increasing in numerical order. Type 4 contains one example each of an acceptable chaplet and an unacceptable unfused chaplet. Type 5 contains one example each of a hot tear and a shrinkage tear, neither of which is acceptable.

Industrial Test Lab., Philadelphia Naval Shipyard, Pa.
INVESTIGATION OF THE BENDING CHARACTERISTICS OF 70-30 AND 90-10 COPPER-NICKEL TUBING, by W. J. Fedyna. Development rept. Jan 57, 41p. ITL Test no. 4267.
Order from LC mi$3.30, ph$7.80 PB 137 103

The fabricating characteristics of the several types of tubing were evaluated by forming quarter bends (90°) at several bend radii on both seamless and welded tubing at three hardness levels. The data indicate that for the same temper (light anneal, soft anneal or light drawn) both the 90-10 and 70-30 seamless and welded copper nickel alloy tubing show comparable bending characteristics insofar as reduction in wall thickness and wrinkling are concerned. The results of tests indicate that when the hardness is less than 55 Rockwell "B" scale, the copper nickel tubing may be formed to a bend radius of 3D without wrinkling on the compression face irrespective of composition (90-10 or 70-30) or type (seamless or welded). The minimum bend radius to which tubes could be formed without exceeding a wall thickness reduction of 8% approximated 6D, provided the hardness did not exceed 62 Rockwell "B" and 41 Rockwell "B" for the 70-30 and 90-10 compositions, respectively. Weld checking observed on the surface of welds after bending was

attributed to sub-surface defects in the deposits. Weld checking was most prevalent on those bends made with the weld in tension. In several cases the weld seam fractured during bending of both 3-1/2" and 6" IPS 90-10 tubing because of poor quality weld metal.

Institute for the Study of Rate Processes, U. of Utah, Salt Lake City.
DESIGN OF A SENSITIVE AUTOGRAPHIC BALANCE, by J. A. Lasater, E. L. Nimer and others. Technical rept. no. 35 on Contract N7onr-451(01). 15 June 52, 12p. 3 refs. AD-19 923.
Order from LC mi$2.40, ph$3.30 PB 135 431

A Reese and Eyring-type apparatus (Textile Research J. 20:743-53, 1950) was modified to study the mechanical properties of single cotton fibers. The apparatus was comprised of a modified Heusser analytical balance, a recording system, a fiber elongating apparatus, and an automatic balance mechanism. The weighing pans were removed from the balance, and an electronically controlled motor was connected to the balance chain drive through a clutch mechanism. The force on a fiber is recorded on a moving drum by a pen mounted on the chain slide. The chain was calibrated so that the distance from the zero position could be converted to grams of force. The fibers are mounted with hooks to the balance beam and to a bar attached to the movable stage. The balance position is detected by employing a light beam and photocells. The output of the photocells is fed through the control grids of the tubes which regulate the direction of the motor required to maintain a zero balance. The apparatus showed a sensitivity of about 1 mg of force change and appeared suitable for force-elongation, force-relaxation, and hysteresis studies.

Naval Gun Factory, Washington, D.C.
CLEANING AND PASSIVATION OF CORROSION RESISTING STEELS, by Lancaster Lowry and Joseph Thompson. Aug 57, 27p. 8 refs. Technical rept. no. NGF-T-28-57; NAVORD rept. no. 5518.
Order from OTS $0.75 PB 131 964

A survey of typical cleaning methods for removing surface contaminants such as scale, flux, slag, metallic lubricant and iron from the surface of corrosion resisting steels. The rate of attack of nitric-hydrofluoric acid pickling solutions and that of nitric acid passivating solutions were evaluated. A damaging heat treatment, producing carbide precipitation in AISI Type 302 steel increased the rate of attack in nitric acid passivating solution and in nitric-hydrofluoric acid pickling solutions. Methods for detecting iron contamination on the surfaces of finished corrosion resisting steel articles were surveyed and evaluated.

Ordnance Tank-Automotive Command, Detroit Arsenal [Center Line, Mich.]
REFERENCE INDEX OF THE CURRENT PROTECTIVE COATINGS SPECIFICATIONS. Rev. Mar 58, 163p.
Order from OTS $3.00 PB 151 166

A digest of military and contractor's specifications for electro-plating, lacquers, paints, and other protective coatings on metals.

Princeton U., N. J.
PROGRAMMING THE SUPPLY OF STRATEGIC MATERIALS. I. MANGANESE MODEL NO. 1. II. COMPUTING MANGANESE MODEL NO. 1, by Herman F. Karreman and Philip Wolfe. Technical rept. no. 2 on Contract Nonr-1858(02). Sep 57, 44p. 10 refs.
Order from LC mi$3.30, ph$7.80 PB 135 721

A model is presented of various possibilities of obtaining manganese and the cheapest method of providing the economy of the United States, in particular its iron and steel industry, with the amount of manganese which it will need from domestic production.

Watertown Arsenal Labs., Mass.
SIMPLE BEND TEST TO MEASURE UNIFORMITY OF DUCTILITY IN SHEET METAL, by Stuart V. Arnold. Aug 57, 6p. Technical note no. WAL 401/283.
Order from OTS $0.50 PB 131 947

A method of bend testing sheet metal was developed which correlates bend angle with incipient rupture. The test is sensitive and particularly suited to measuring uniformity of sheet metal ductility.

Watertown Arsenal Labs., Mass.
SOME FACTORS INVOLVED IN FORGING TITANIUM AND TITANIUM ALLOYS, by Robert B. Rich. June 57, 37p. 6 refs. Rept. no. WAL 401/269.
Order from OTS $1.00 PB 131 945

Factors were studied such as the amount of energy required to drop forge to varying strains, the optimum forging temperature for a given alloy, the effect of strain rate and forging termperature on deformation, and the effect of various lubricants during forging. These grades of titanium (commercially pure RC-55 and RS-55, RD-130A, Ti-150A) were impact forged at temperatures from 1300° to 2100°F by using energy up to 2310 ft-lb, average strain rates from 39 to 120 sec^{-1}, and slug volumes of 0.785, 2.65, and 16.3 $in.^3$.

MATERIALS

Quartermaster Research and Engineering Center, Natick, Mass.
TANNING HEAVY LEATHER WITH ALDEHYDES, by Ludwig Seligsberger. Jan 58, 78p. 56 refs. Footwear and Leather Series rept. no. 11.
Order from OTS $2.00 PB 131 965

A number of new aliphatic aldehydes are shown to be eminently suitable for tanning. Also, for other previously known aldehydes, new conditions of application were discovered which increase their usefulness and point the way to practical tanning processes for sole leather, eliminating in part or

in full the use of foreign extracts. Pilot-plant experiments produced leather which in appearance and equality was equal to that of the present standard vegetable tannage. This result was accomplished at a saving in time.

Ceramics and Refractories

Battelle Memorial Inst., Columbus, Ohio.
TENSILE PROPERTIES OF CERAMIC BODIES THROUGH THE USE OF TRANSVERSE LOADING, by W. H. Duckworth and C. R. Austin. Special rept. 5 Apr 48, declassified 15 Nov 53, 25p. 13 refs. NEPA 591-BAT-10; AD-143 430.
Order from LC mi$2.70, ph$4.80 PB 135 681

Battelle Memorial Inst., Columbus, Ohio.
APPARATUS FOR MODULUS OF RUPTURE OF DETERMINATIONS AT ELEVATED TEMPERATURES, by C. G. Harman, J. F. Quirk, and E. C. Hoeman. Topical rept. 29 Mar 50, 14p. NEPA 1383-BAT-41; AD-143 429.
Order from LC mi$2.40, ph$3.30 PB 135 672

An apparatus and a method of testing were developed to determine moduli of rupture of ceramic specimens at temperatures ranging from room temperature to 2500°F. The apparatus, which could be operated in oxidizing or protective atmospheres, permitted the simultaneous testing of as many as ten specimens. The results of tests to determine the moduli of rupture of sintered carbide compacts at 2500°F. indicated that the average deviation from the mean value was ten per cent, which was comparable with results obtained for the same materials tested at room temperature with conventional equipment.

Institute for the Study of Rate Processes, U. of Utah, Salt Lake City.
MICRO HARDNESS OF CORUNDUM, by J. Lambert Bates and Peter Gibbs. Technical rept. no. 6 on Contract Nonr-1288(03). Aug 57, 2p. 1 ref.
Order from LC mi$1.80, ph$1.80 PB 135 747

National Bureau of Standards, Washington, D.C.
DEVELOPMENT OF MATERIALS FOR TRANSMITTING INFRARED ENERGY, by F. W. Glaze, D. H. Blackburn, and W. Capps. Rept. on Ceramic and Cermet Materials, Contract AF 33(616)5316. Mar 55, 83p. 12 refs. WADC Technical rept. 54-457; AD-75 594.
Order from LC mi$4.80, ph$13.80 PB 135 542

Study was continued on the development of IR transmitting materials for windows, lenses, and prisms for use in the optical systems of heat-seeking devices. No oxide glass provided transmittances much beyond 6 μ for thicknesses of 2 mm. The Ca aluminates showed high deformation points (over 740°C), high abrasive resistance, and a prominent water absorption band at 2.9 to 3.0 μ. In comparison, the best commercial As_2S_3 glass has a transmittance of 40% or more out to 12.3 μ in 2mm thicknesses. Descriptions are presented of the physical and chemical properties and of an improved method of making As_2S_3 glass. Heat treatment was used to increase the modulus of rupture of the As_2S_3 glass. Attempts were made to improve the physical properties of As_2S_3 glass by nonoxide and oxide additions. Several binary selenides, including As_2Se_3, showed good transmittances in the IR; however, their properties were generally inferior to As_2S_3. Hot-pressing experiments with As_2S_3 powder yielded 1 sample with transmittance of 65% at 8 μ. Investigation was made on the pressing and sintering of powdered crystalline IR materials. These materials included fluorides of the alkaline earths and magnesia and alumina. A transmittance of 32% at 13 μ was obtained on a sample of BaF_2, of -200 mesh, fired at 700°C.

Northrop Aircraft, Inc., Hawthorne, Calif.
STABILITY OF TANTALUM NITRIDE IN HYDROGEN AT ELEVATED TEMPERATURES, by L. A. Ohlinger. Rept. on the Stability of Refractory Elements and Compounds in a Hydrogen Atmosphere at Elevated Temperatures. 10 Aug 48, declassified 15 Nov 53 [20] p. Rept. NRR-161; NEPA-734-NOR-50; AD-146 569.
Order from LC mi$2.40, ph$3.30 PB 135 662

Specimens of tantalum nitride were subjected to a series of heat-treatment in H and He atmospheres. A shell thought to be TaC was formed on all specimens exposed to He above 2000°C. In H, as in He, at temperatures up to 2700°C, a shell was formed and the percentage weight loss increased with the temperature although above 2000°C it was less than in He. At 2700°C the interior of the specimen became more roughly granular and porous. One particular specimen exhibited some deflagration of the Ta_3N_5 as the specimen was heated above 2200°. Exposing the tantalum nitride at 2410°C to H for longer periods of time had no apparent additional effect on the specimens. Tantalum nitride apparently decomposed before reaching its melting point. A specimen subjected to cyclic shock in He at temperatures from 2200° to 2400°C shattered after the fourth cycle indicating that the material has relatively poor shock resistance. Tantalum nitride appeared to be a good refractory and to be stable and suitable for use in He or H at temperatures below 2000°C. At temperatures up to 2700°C the material is probably still stable in the absence of C.

Ohio State U. Research Foundation, Columbus.
INVESTIGATION OF VAPOR PRESSURE OF METALS AND METAL OXIDES, by H. L. Johnson. Quarterly progress rept. no. 12 on Contract N6onr-225(01). 1 July 49, 3p. AD-137 831.
Order from LC mi$1.80, ph$1.80 PB 135 356

A short status report on studies made on the vapor pressure of columbium, alumina, zirconium, boron, chromium, aluminum, and tantalum.

Fuels, Lubricants, and Hydraulic Fluids

Bureau of Aeronautics, Washington, D.C.
FIELD HANDLING OF CONCENTRATED HYDROGEN PEROXIDE (OVER 52 WEIGHT PERCENT HYDROGEN PEROXIDE). Handbook 1 July 55, rev. 15 Oct 58. 137p. NAVAER 06-25-501(rev.)
Order from OTS $2.75 PB 131 265(rev.)

Superseding or supplementary pages to NAVAER 06-25-501, 1 July 55, PB 131 265 (OTS $3.25)

The purpose of the Handbook is to provide a uniform policy for the safe and intelligent field handling of concentrated hydrogen peroxide, covering the range from 52 to 99 weight-percent hydrogen peroxide.

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DECOMPOSITION BURNING OF MONOPROPELLANT DROPS: HYDRAZINE, NITROMETHANE AND ETHYL NITRATE, by Willis A. Rosser, Jr. Rept. on Contract DA 04-495-ORD-18. 15 Jan 57, 14p. 9 refs. Progress rept. no. 20-305.
Order from LC mi$2.40, ph$3.30 PB 135 689

The mass evaporation rate of a simulated hydrazine drop is studied in the presence of an enclosing hydrazine-decomposition flame. The drop is simulated by a porous alumina sphere internally supplied with liquid hydrazine. A number of significant parameters are varied in order to determine their effect on the evaporation rate. These parameters include the droplet radius, the chemical composition of the liquid, and the transport properties of the gas phase. The experimental measurements are compared with a theoretical analysis and with the results of strand-burning measurements.

Springfield Armory, Mass.
RATE OF DRAINAGE AND EVAPORATION OF SOME LIGHT LUBRICATING AND PRESERVATIVE OILS, by R. L. Keleher and A. Hitchins. Oct 56, 12p. SA-TR 16-1049.
Order from LC mi$2.40, ph$3.30 PB 135 417

Steel panels were grit blasted to simulate the finish of gun parts. After being dipped in the test oils, the panels were weighted at intervals, and the weight of oil retained in the panels was noted. After the first 24 hours, the loss of synthetic oils from the panels was considerably smaller than the loss of petroleum-base oil. After one week of exposure to laboratory atmosphere, the panels retained more of the synthetic oils than they did of the petroleum-base oil.

Paints and Finishes

Metcut Research Associates [Cincinnati, Ohio]
HIGH TEMPERATURE COATINGS FOR CHROMIUM HOT WORK TOOL STEELS, by Elwood B. Norris. Rept. for Jan 57-June 58 on Finishes and Materials Preservation, Contract AF 33(616)3916. Oct 58, 84p. WADC Technical rept. 58-269; AD-203 121.
Order from OTS $2.25 PB 151 423

Chromium hot work tool steels are normally useful to approximately 1000°F provided that they are protected from corrosive atmospheres. A typical 5% chromium tool steel, Thermold J, was used to study the protective qualities of various plated, dipped or sprayed coatings. In addition to investigating the oxidation and corrosion protection, selected coatings were checked for their effect on tensile, stress-rupture and fatigue properties of the base metal at room and elevated temperature. The relative resistance of the selected coatings to abrasion and thermal shock was also studied. From a corrosion standpoint, the best of the coatings investigated were Nickel-zinc, Aluminizing, Alumicoat and Nickel. Of the selected coatings, Aluminizing and Alumicoat reduced the strength of the base metal because of the high temperatures encountered during coating. Aluminum-silicone paint was the only coating which did not significantly reduce the fatigue strength. Watts nickel had high thermal shock resistance. Electroless nickel had the best abrasion resistance.

Vitro Labs., West Orange, N.J.
RAIN EROSION RESISTANT COATINGS FOR RADOMES, by A. C. Werner, R. J. Abelson, and D. T. Kalman. Monthly progress rept. for 14 May-13 June 56, on Contract NOas 56-382-c, July 56, 3p.
Order from LC mi$1.80, ph$1.80 PB 135 552

Plastics

Institute of Polymer Research, Polytechnic Inst. of Brooklyn, N.Y.
PROGRESS REPT. NOVEMBER 1, 1953 TO JANUARY 31, 1954 on Contract Nonr-1129(00). Feb 54, 38p. AD-28 212.
Order from LC mi$3.00, ph$6.30 PB 135 454

The hydrolysis and reacetylation experiments for the characterization of parent polyvinyl acetates were completed. The occurrence of some microgel particles in the reacetylated samples disturbed the molecular weight determinations, but the existence of moderate branching was certain. The increase in molecular weight when polyacetals were prepared indicated cross-linking reactions including acetal bridges. The oxidation of the low-molecular-weight alcohols in the Wash Primer formula by H_2CrO_4 produced Cr^{+++} ions which precipitated the resin and apparently formed complexes with both hydroxyl groups and acetal rings. The formation of the Wash Primer coating seems to proceed via adsorption of complexed and precipitated resin on metal surfaces with further cross-linking and precipitation reactions taking place during the drying. Refractive index, viscosity, and IR methods were investigated for their suitability in polyvinylacetal and polyvinyl acetate adsorption studies. Adsorption isotherms were obtained for acetates and formals; they were similar to Langmuir isotherms.

Materials Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
THE EFFECTS OF GAMMA IRRADIATION ON ACRYLONITRILE-BUTADIENE COPOLYMERS, by John A. Parker, Freeman F. Bentley and others. Rept. for June 56-Aug 57 on Materials Analysis and Evaluation Techniques. Sep 58, 98p. 100 refs. WADC Technical rept. 58-78; AD-155 871.
Order from OTS $2.50 PB 151 261

Changes in the chemical and physical properties produced by the irradiation of a series of acrylonitrile-butadiene copolymers varying in composition from 20 to 50% acrylonitrile with gamma photons from a cobalt-60 source have been measured and correlated with the nature of the copolymer, initial type of cure (sulfur, peroxide, or radiation), and the total integrated dose. This dose has been converted to the energy equivalent in graphite units now being recommended for standardized dosage terminology. The efficiencies of these cross-linking processes induced by radiation have been estimated from the molecular weights between cross-links, determined by swelling volume measurements by a procedure similar to that used for natural rubber by Charlesby. The efficiencies of cross-linking determined in this way are a more realistic measure of the relative stabilities of these copolymers than a comparison of the complex physical properties. The qualitative changes in the chemical structure associated with the radiation induced cross-linking have been characterized by infrared spectra. By using the incremental change in modulus it is possible to apply the empirical equation proposed by Sisman and Bopp relating the change in Young's modulus to total dose. Specific constants for these equations have been calculated for this series of elastomers by means of which one may predict the useful life of mechanical rubber goods compounded from them in a radiation field of known intensity.

Minnesota U., Minneapolis.
INFLUENCE OF SOIL FACTORS IN THE MICROBIOLOGICAL DECOMPOSITION OF CELLULOSE UNDER THE CONDITIONS OF THE SOIL BURIAL TEST, by E. L. Schmidt. Quarterly rept. 11, 20 Oct-31 Dec 57 and Final rept. for 20 Apr 55-31 Dec 57 on Contract DA 19-129-qm-351. Apr 58, 34p.
Order from LC mi$3.00, ph$6.30 PB 135 352

The importance of soil reaction to cellulolytic activity was assessed under soil burial test conditions. Acid soils treated with lime to raise the pH were improved in cellulolytic activity. Improvement was most evident for three light textured, poorly buffered acid forest soils, and least evident for two heavier, better buffered soils. Acidification of three soils normally around pH 7 by prolonged incubation with sulfur sharply decreased cellulolytic activity in soil burial. Full activity was regained rapidly by the addition of enough calcium carbonate to restore the normal reactions of the soils. As concluded from earlier studies it appears that the most important single characteristic of a soil for use in soil burial is that it have a reaction around neutrality.

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
CONTRACTILE PROPERTIES OF POLYELECTROLYTES, by W. Budd and J. Mikula. Oct 57, 26p. Rept. no. R-1413.
Order from OTS $0.75 PB 131 939

Polymethacrylic acid was cross-linked with divinylbenzene forming a gel which expanded in dilute basic solutions and contracted in dilute hydrochloric acid solutions. Polyvinyl phosphate films were prepared by phosphorylation of polyvinyl alcohol films. These films expanded to about twice their contracted length during the contractile tests, but they had poor tensile strength and could support no more than their own weight in aqueous solutions. Polyvinyl alcohol-polyacrylic acid films were prepared by evaporation of a solution of vinyl alcohol-acrylic acid copolymer. These films expanded 20 to 40% of their contracted length. The films had fair tensile strength in solution and were able to lift weights up to 416 g/cm^2. The magnitude of response was independent of load. The response times for a contractile cycle ranged from 60 minutes in 0.005N solutions to 6 minutes in 1.0N solutions. Orienting of the films by stretching increased their magnitude of expansion. When the sodium hydroxide solution increased above 0.04N, a decrease in the magnitude of expansion of the film resulted.

Rhodes Lewis Co., Los Angeles, Calif.
GUNFIRE TESTS ON TRANSPARENT PANELS, by Carlos J. Cardona. Rept. on Contract AF 33(038) 23312. June 53, 373p. WADC Technical rept. 53-375; AD-38 143.
Order from LC mi$11.10, ph$57.60 PB 135 700

A series of bullet penetration tests were conducted on transparent plastic sheets and laminated glass and are described herewith. Tests were performed at the Rhodes Lewis Co. firing range using especially loaded 50 caliber and 20mm ammunition. Laminated plastics showed a marked difference in shock resistance at the various external temperatures.

Rubber and Elastomers

Atlantic Research Corp., Alexandria, Va.
SYNTHESIS OF RUBBER BY MICROORGANISMS, by Moira Kuhl, Mildred R. Stewart and others. Final rept. for 1 June 53-31 July 56 on Contract Nonr-1233(00). Aug 56, 25p. 9 refs.
Order from LC mi$2.70, ph$4.80 PB 135 509

The feasibility of the isolation and cultivation of species of fungi known to be capable of rubber synthesis, of their adaptation to cultivation on liquid media, and of their ability to produce rubber when cultivated on liquid media has been demonstrated. More than twenty species of the rubber-producing, latex-bearing genus Lactaria were collected. All but two of these were isolated in pure culture. Six of the fastest growing species, and three mutants of Lactaria subdulcis, were grown in liquid media,

using a two-week culture period at temperatures ranging from 22°C to 26°C, until sufficient cell material was harvested for rubber extractions. The harvested mycelia were extracted with alcohol, acetone, and benzene while blanketed with nitrogen.

Detroit Arsenal, Center Line, Mich.
OZONE RESISTANCE OF NATURAL RUBBER TIRES, by Walter O. Perrott. Final rept. 25 Sep 56, 17p. Rept. no. 3721; AD-110 931.
Order from LC mi$2.40, ph$3.30 PB 135 333

The O_3 resistance of 9.00-20, 8 PR NDCC natural-rubber tires was evaluated in static and dynamic O_3 tests conducted in accordance with MIL-T-12459A (Ord). Drum-test tire temperatures are tabulated; only slight variations were observed. Wheel-tested specimens exhibited a greater degree of deterioration than the aged or unrun specimens after being tested in the static O_3 chamber. Unrun-aged test specimens exhibited a greater degree of deterioration than the aged or unrun specimens after being tested in the dynamic O_3 chamber. No consistent relationship was observed between the static and dynamic O_3 tests.

Materials Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
POLYMERS DERIVED FROM DIHYDROPERFLUOROBUTYL ACRYLATE, by Fred W. Knoblock and Horace C. Hamlin. Rept. for Oct 52-Jan 54 on Synthesis and Evaluation of New Polymers. Sep 55, 36p. 3 refs. WADC Technical rept. 55-25; AD-93 171.
Order from OTS $1.00 PB 131 998

Exploratory copolymerizations of 1, 1-dihydroperfluorobutyl acrylate with various other monomers selected from such general classes as 1, 3 dienes, unsaturated acids, acrylamides, haloacrylates, vinyl alkyl ethers, vinyl silanes and allyl esters of unsaturated acids are described. Preliminary compounding recipes and evaluation data are presented for those systems which appeared to be of definite interest in connection with the development of specialty elastomers for Air Force applications.

Quartermaster Research and Engineering Center, Natick, Mass.
CHEMICAL RESISTANCE AND THERMAL STABILITY OF FLUOROCARBON ELASTOMER 214, by Angus Wilson, C. B. Griffis, and J. C. Montermoso. Dec 57, 25p. Technical rept. CP-4.
Order from OTS $0.75 PB 131 942

Fluorocarbon elastomer 214, a copolymer of vinylidene fluoride and perfluoropropene developed under the Quartermaster Rubber Research Program, was evaluated from resistance to fuels, oils, acids, and heat. It was compared with Kel-F Elastomer 3700 and both materials were cured with a peroxide, an amine, and a new curing agent HMDA-Carbamate. Samples of the Materials were exposed for 5 and 70 hours in air, motor oil, diester oil, silicate ester oil and isooctane/toluene test fluid at various test temperatures. Both elastomers exhibited excellent resistance to red fuming nitric acid, but poor resistance to low temperatures. Tests showed neither elastomer to be serviceable below 15°F.

MATHEMATICS

California U., Berkeley.
PERTURBATION THEORY OF PERIODIC SURFACES II, by Stephen P. Diliberto. Technical rept. no. 9 on Contract Nonr-222(37). Apr 57, 81p. 6 refs.
Order from LC mi$4.80, ph$13.80 PB 135 591

There were two principal results in Part I(PB 125 212): one was the formulation of a class of perturbation problems having interest in oscillation theory, and the other a demonstration (in this more general setting) that a small divisor assumption of Kryloff and Bogiliuboff could be weakened to an assumption concerning certain mean values. These partial results required, except in the simplest case, small divisor assumptions. The principal result of this paper is the solution of this last difficulty.

Columbia U., New York
A SEQUENTIAL DECISION PROBLEM WITH A FINITE MEMORY, by Herbert Robbins. Rept. on Contract AF 18(600)442. 1956, 3p. Rept. no. Cu-39-56; AD-116 637.
Order from LC mi$1.80, ph$1.80 PB 135 579

The problem is considered of successively choosing one of two ways of action, each of which may lead to success or failure, in such a way as to maximize the long-run proportion of success obtained, the choice each time being based on the results of a fixed number of the previous trials.

Cornell U., Ithaca, N. Y.
SUMMABILITY METHODS AND SPECTRAL ANALYSIS, by Carl S. Herz. Rept. no. 53 on Contract AF 18(600)685. Aug 56, 11p. AFOSR TN-56-345; AD-95 431.
Order from LC mi$2.40, ph$3.30 PB 134 413

It is shown that the spectrum of a bounded measurable function on the real line may be defined in terms of any of a large variety of summability methods. Known theorems in this connection for Abel and (R, 2) summability can be extended quite generally. In addition a new, sharp theorem on summability of formal products is given.

Institute for Advanced Study, Princeton, N.J.
SOME GLOBAL PROPERTIES OF CONTACT STRUCTURES, by John W. Gray. Rept. on Contract AF 18(600)1109. May 58, 46p. 17 refs. AFOSR TN-58-431; AD-158 235.
Order from LC mi$3.30, ph$7.80 PB 135 154

The study of pseudogroups in a systematic manner originated in the work of Sophus Lie on infinite, continuous, transformation groups. The second volume of this work is devoted to the local study of contact transformations in general and to the study of global contact transformations in the special case of

Euclidean space. In attempting to generalize Lie's results to more general manifolds, it becomes clear that there are intrinsic global differences between the even and odd dimensional cases. In this paper, only the odd dimensional case will be discussed.

Institute for Advanced Study, Princeton, N.J.
THE SPECTRAL THEORY OF BOUNDED FUNCTIONS, by Carl S. Herz. Rept. on Contracts AF 18(600)685. Apr 58, 90p. AFOSR-TN-58-363; AD-154 268.
Order from LC mi$4.80, ph$13.80 PB 134 928

An exhaustive survey is given of the spectral theory of bounded functions. The exposition is carried out on a locally compact Abelian group. The discussion is divided into 6 parts; the spectrum, the point spectrum, potential theory and spectral analysis, the spectral synthesis problem, representations, and examples of spectral synthesis.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
ON HIGHER ORDER BOUNDARY VALUE PROBLEMS FOR HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS IN TWO AND THREE VARIABLES, by A. K. Aziz. Rept. on Contract AF 49(638)228. July 58, 58p. 13 refs. Technical note no. BN-130; AFOSR TN-58-566; AD-158 385.
Order from LC mi$3.60, ph$9.30 PB 135 563

This paper is concerned with certain boundary value problems, which may involve higher order partial derivatives in the boundary conditions, for the hyperbolic partial differential equations
$u_{xyz} + au_{xy} + bu_{xz} + cu_{yz} + du_x + eu_y + fu_z + gu = h(x, y, z)u_{xy} + au_x + bu_y + cu = f(x, y, u, u_x, u_y)$.

Institute of Statistics, North Carolina U., Chapel Hill.
ON LINEAR ASSOCIATIVE ALGEBRAS CORRESPONDING TO ASSOCIATION SCHEMES OF PARTIALLY BALANCED DESIGNS, by R. C. Bose and Dale M. Mesner. Rept. on Contract AF 18(600)83. Jan 58, 30p. 18 refs. Mimeograph series no. 188; [AFOSR TN-58-78] ; AD-148 126 (In cooperation with Michigan State U.)
Order from LC mi$3.00, ph$6.30 PB 135 602

Contents:
Association schemes as concordant graphs
Association matrices
Applications to combinatorial problems
Applications of algebraic properties of association matrices
Characteristic roots of matrices in the algebras

Laboratory of Statistical Research, U. of Washington, Seattle.
DISTRIBUTION-FREE UPPER CONFIDENCE BOUND FOR Pr $\{Y < X\}$, BASED ON INDEPENDENT SAMPLES OF X AND Y, by Z. W. Birnbaum and R. C. McCarty (Boeing Airplane Co.). Technical rept. no. 28 on Contract Nonr-477(11). July 57, 12p. 8 refs.
Order from LC mi$2.40, ph$3.30 PB 134 996

A solution for the problem of obtaining a distribution-free one-sided confidence interval for $p = Pr\{Y < X\}$ has been proposed in Proceedings of the Third Berkeley Symposium on Mathematical Statistics and Probability, v. 1, p. 13-17. At present a numerical procedure is given for computing the sample sizes needed for such a confidence interval with given width and confidence level.

Naval Ordnance Lab., Corona, Calif.
SOME MATHEMATICAL ASPECTS OF AUTOCORRELATION, by Robert P. Mitchell. May 57, 23p. 5 refs. NOLC rept. 371; NAVORD rept. 4617.
Order from LC mi$2.70, ph$4.80 PB 135 558

Let F (t) be a continuous complex-valued time series defined on the interval $0 \leq t \leq T$, which may be characterized as a linear combination of an almost periodic (signal) function and a random noise function. Let $\Psi(\tau)$ be the finite autocorrelation function of F (t)

$$\Psi(\tau) = \frac{1}{T}\int_0^T F(t+\tau)\,\overline{F(t)}\,dt$$

The function $\Psi(\tau)$ differs from the autocorrelation function of F(t) computed for an infinite time series, and the major source of this error is shown to be cross-correlation of signal and noise functions and autocorrelation of noise alone, both of which occur in computation of $\Psi(\tau)$. The type of error of greatest practical import is the perturbation induced by these quantities upon the periodicities present in F(t). This type of error is shown to be less than a quantity which depends upon the signal amplitude. Properties of Fourier representations of random noise are discussed for both the finite and infinite intervals. The hypothesis is advanced that a series of the type

$g(t) = \sum_{k=1}^{N} c_k \exp(i\alpha t \sin \rho_k)$, where the ρ_k are random phase angles, provides a more accurate representation of random noise than the usual Fourier series.

Rome Air Development Center, Griffiss AFB, N.Y.
PROPERTIES OF REDUNDANCY NETWORKS WITH EQUAL ELEMENT RELIABILITY VALUES, by Fred Moskowitz. June 58, 35p. RADC TN-58-146; AD-148 749.
Order from LC mi$3.00, ph$6.30 PB 135 313

A redundancy network function with one degree of freedom is described. The behavior of the network is examined as the reliability of a single element is allowed to vary within an open ended region between zero and one. This restriction of the single element reliability permits a study of the behavior of the network function in a general way without the necessity of analyzing specific circuit configurations. A method is given for the systematic evaluation of canonical coefficients and a few illustrative examples are presented.

Virginia U., Charlottesville.
COMPACTNESS OF CERTAIN MAPPINGS, by G. T. Whyburn. Technical note no. 6 on Topological Aspects of the Theory of Functions, Contract AF 49(638)71. May 58, 15p. AFOSR TN 58-450; AD-158 256.
Order from LC mi$2.40, ph$3.30 PB 134 772

A mapping of one topological space onto another is compact provided the inverse image of each compact set in the range space is itself a compact set. When this property is present the action of the mapping is in most essential respects similar to that of a mapping on a compact domain space. In this paper the objective will be the development of conditions, in situations of interest, which imply compactness of the mapping or properties closely related thereto and also to study the implications of these related properties.

Computing Devices

National Cash Register Co., Dayton, Ohio.
RESEARCH ON ELECTRO-OPTICAL AND MAGNETIC CORE LOGIC, by T. G. Marshall, Jr. and L. J. Andrews. Rept. for 15 Sep 56-15 Sep 57 on Automatic Computation Techniques and Components, Contract AF 33(616)3837. Sep 57, 43p. 15 refs. WADC Technical rept. 57-607; AD-142 017.
Order from OTS $1.50 PB 151 257

This report describes and summarizes the following two research projects. Part One: "Phosphor-photoconductor Research," summarizes research work on the application of phosphor-photoconductor elements towards advancing digital computer techniques. A description is given of the physical properties of electro-luminescent and photoconductive materials, including their electrical characteristics, and demonstrates ways in which circuit elements can be constructed by a combination of such materials to perform the logical "OR" and "AND" functions for use in digital computers. Objectives were reached in the form of logical devices which employed such materials. Part Two: "Core Logic Summary," summarizes research work on a magnetic core logic system which allows a substantial reduction in the number of active elements in the circuit and increases the utilization of those elements remaining in the circuitry. Brief descriptions and references to transistor circuits and magnetic core circuits, used as components of the system, are included. Objectives were realized, which culminated in functional units of small size and high reliability. These devices should prove useful in magnetic core digital computer systems based on inhibit-current drive techniques.

Radiation, Inc., Melbourne, Fla.
A HIGH-SPEED ELECTRONIC PRINTER FOR DIGITAL COMPUTER OUTPUT, by W. Scott Grant. Final engineering rept. for 1 May 56-14 Mar 57 on Contract AF 33(616)3660. Nov 57, 98p. WADC Technical rept. 57-120; AD-155 634.
Order from OTS $2.50 PB 151 331

This is the Final Engineering Report concerning the development and design of "A High-Speed Electronic Printer for Digital Computer Output". This report describes the electrical and mechanical design requirements of the equipment and the resulting circuit design. Based on the use of a Radiation, Inc. fixed multistylus recorder, the system that evolved comprises a single timer unit, a single numeric function generator, and twelve character elements. The character elements are identical; each consists of the necessary circuitry to produce any decimal digit 0-9, a minus sign, and a decimal point. The High-Speed Printer will write twelve characters in parallel across a five-inch chart at a speed of 2160 characters per second. The printer uses a 6-bit binary code input based on the Flexowriter system from an ERA 1103 Computer. This report also includes operating procedures and future design considerations.

MECHANICS

Aerodynamics and Pneumatics

Advisory Group for Aeronautical Research and Development, Paris (France).
STRUCTURES ET CHALEUR AUX VITESSES SUPERSONIQUES ET HYPERSONIQUES, by B. Dorleac. Nov. 57, 110p. (In French)
Order from NASA* AGARD-149

The paper is in two parts. The first part indicates some structural problems and design types investigated in France during the last few years, while the second part refers to structural problems of the future. In conclusion, the author attempts to draw up a programme of work in connection with the development of materials and structures, which would prove valid for the immediate future.

Aircraft Lab., Wright Air Development Center, Wright-Patterson, Ohio.
AERODYNAMIC NOISE AND THE ESTIMATION OF NOISE IN AIRCRAFT, by Orville R. Rogers and Robert F. Cook. Dec 52, declassified 5 Nov 53. 44p. WADC Technical rept. 52-341; AD-13 026.
Order from LC mi$3.00, ph$6.30 PB 135 909

A method is presented for estimating aerodynamic noise as it appears inside aircraft from a knowledge of the insulation design, the aircraft design, and the operating characteristics of the aircraft. A method for estimating sound reduction, empirical results on aerodynamic noise, the estimation of external noise for certain aircraft, the transmission and absorption of typical structures, and the weight necessary to soundproof to predetermined levels are discussed in detail.

*National Aeronautics and Space Administration
1520 H Street, N. W.
Washington 25, D. C.

Arnold Engineering Development Center, Tullahoma, Tenn.
TRANSONIC TESTS OF AN AGARD MODEL B AND A MODIFIED MODEL C AT 0.01-PERCENT BLOCKAGE, by J. R. Milillo. Rept. on Contract AF 40(600)700. Aug 58, 34p. 3 refs. AEDC TN-58-48; AD-161 050.
Order from LC mi$3.00, ph$6.30 PB 135 751

Three-component, force test were conducted at Arnold Engineering Development Center in the Propulsion Wind Tunnel's 16-ft Transonic Circuit on AGARD MODEL B and a modified Model C. Mach number range was from 0.7 to 1.5, angle-of-attack range was from -4 to +10 deg, and model blockage factor was 0.010. Data were essentially interference free at all Mach numbers.

Gas Turbine Lab., Mass. Inst. of Tech., Cambridge.
SHEAR FLOW IN BENDS, by E. S. Taylor and R. C. Dean. Progress rept. no 14, 15 Dec 52-13 Jan 53, on Contract N5ori-078(48). 15 Jan 53, 3p. AD-9960.
Order from LC mi$1.80, ph$1.80 PB 135 105

Institute of Aerophysics, U. of Toronto (Canada).
THEORY OF FREE-MOLECULE, ORIFICE-TYPE PRESSURE PROBES IN ISENTROPIC AND NON-ISENTROPIC FLOWS, by G. N. Patterson. Rept. on Contract AF 18(600)1185. Nov 56, 21p. UTIA rept. no. 41; AFOSR TN-57-13; AD-115 045.
Order from LC mi$2.70, ph$4.80 PB 134 415

This report presents the theory of a pressure probe in the form of an orifice in the side of a tube which may be orientated in any direction relevant to that of the mass motion and which is so small, compared with the local mean free path, that free-molecule flow occurs. The theory shows that such a tube will measure the local speed ratio in isentropic and nonisentropic flows and suggests that in strong shock waves it may be possible to determine the viscosity and heat conduction, that is, the deviation from Maxwellian molecular motion.

National Advisory Committe for Aeronautics, Washington, D. C.
TABLES AND GRAPHS OF NORMAL-SHOCK PARAMETERS AT HYPERSONIC MACH NUMBERS AND SELECTED ALTITUDES, by Paul W. Huber. Sep 58, 26p. 17 refs.
Order from NASA* NACA TN-4352

Tables and graphs of normal-shock parameters corresponding to six selected altitudes below 300,000 feet and for temperatures behind the shock from 2,000°K to 11,000°K are presented for real air in thermal and chemical equilibrium. The altitude data and real-air thermodynamic data used in the computations represent reliable values for application to aerodynamic flight in the atmosphere. Values of the normal-shock Mach numbers, flight velocity, enthalpy behind the shock, and of pressure, density, temperature, and velocity-of-sound ratios are presented to show variations with temperature behind the shock, flight Mach number, and altitude.

*National Aeronautics and Space Administration
1520 H Street, N. W.
Washington 25, D.C.

Naval Ordnance Lab., White Oak, Md.
HYPERSONIC TUNNEL NO. 4 RESULTS IX: DEVELOPMENT OF A WATER-COOLED STRAIN-GAGE BALANCE (INCLUDING STRING EFFECTS) AND ITS APPLICATION TO A STUDY OF NORMAL FORCES AND PITCHING MOMENTS OF A CONE-CYLINDER TO MACH NUMBERS 5 TO 8, by L. L. Liccini. Aug 56, 36p. 14 refs. NAVORD rept. 4334.
Order from LC mi$3.00, ph$6.30 PB 135 565

A two-component internal water-cooled strain-gage balance designed to minimize temperature effects was developed for operation in the NOL 12 x 12 cm Hypersonic Tunnel No. 4. The calibration indicated that the balance is as accurate as the present day internal strain-gage balances used in supersonic wind tunnels. Investigations of the effect of the sting on the balance readings, made at a Mach number of 6.4, confirmed Harkins' results obtained at a Mach number of 5.8. The normal force and pitching moment of a cone and a cone-cylinder model were measured with the use of a water-cooled balance through an angle of attack range of -3° to +12° at nominal Mach numbers of 5, 6, 7, and 8 with a maximum stagnation temperature of 870°F. The data agree with the Newtonian and modified Newtonian theory of Grimminger, Williams and Young (J. Aero. Sci. 17, no. 11: Nov. 1950). The cross-flow Mach number yields a satisfactory approximation of the average leeward pressure of a cylinder for use in the modified Newtonian theory.

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
THE DRAG COEFFICIENT OF LOW ASPECT RATIO SUPERSONIC WINGS, by Ruth D. Armstrong. [1947] 51p. NEPA-915-EDR-7; AD-143 437.
Order from LC mi$3.60, ph$9.30 PB 135 669

Calculations were made to determine the total drag of supersonic airfoils as a function of wing thickness-chord ratio, aspect ratio, altitude, and wing area over a range of Mach numbers. Graphs are presented which show the variation of L/D with lift coefficient as well as lift-drag polars.

Propulsion Research Corp., Santa Monica, Calif.
NUMERICAL ANALYSIS OF INVISCID SUPERSONIC FLOWS, UTILIZING THE STREAMSURFACE CHARACTERISTICS METHOD, by C. Cobb, H. G. Loos, and S. Manus. Rept. on Theoretical and Experimental Supersonic Flow Studies Related to Turbomachine Design, Contract AF 18(600)1143. Jan 58, 34p. Rept. no. R-279; AFOSR TN-58-105; AD-152 014.
Order from LC mi$3.00, ph$6.30 PB 134 866

The Streamsurface Characteristics Method has been programmed for the IBM-650 digital computer. As a result, the isentropic supersonic flow between

two close surfaces of arbitrary but regular shape, subject to proper boundary conditions, can be determined at a speed of about 1 3/4 minutes per point. The IBM-650 computer was found to be somewhat too small for the present problem. The numerical examples involving internal supersonic flow problems are given.

Rosemount Aeronautical Labs., U. of Minnesota, Minneapolis.
RESEARCH ON LAMINAR AND TURBULENT BOUNDARY LAYERS AT SUPERSONIC SPEEDS, by W. S. Bradfield. Final summary rept. on Contract AF 18(600)384. Dec 57, 305p. 106 refs. Research rept. no. 131; AFOSR TR-57-64; AD-136 559.
Order from LC mi$11.10, enl. pr. $50.10
PB 136 777

A synthesis is presented of results obtained in research under the writer's direction on cone boundary layers in the moderate Mach number range ($1 < M_\infty < 6$). Included are laminar and turbulent boundary layer investigations of friction and heat transfer; some effects on boundary layer development of a shockwave at the boundary layer origin; some effects of yaw on boundary layer development; a discussion of possible probe errors; design, development, and application of a boundary layer total temperature probe; and a description of a new schlieren apparatus suitable for study of compressible flow details.

Statics, Kinematics, and Kinetics

Carnegie Inst. of Tech., Pittsburgh, Pa.
RESEARCH AND DEVELOPMENT ON DETERMINATION OF COEFFICIENTS OF FRICTION BETWEEN DRY METALLIC SURFACES, by Eber W. Gaylord and Hunter Shu. Rept. on Contract DA 36-061-505-ORD-545. Oct 57, 51 p. WAL rept. no. 401/65-40.
Order from OTS $1.50 PB 131 943

Coefficients of static friction have been determined for mild steel rubbing on mild steel, titanium RC 130B on mild steel, titanium RC 103-B rubbing on uranium, uranium rubbing on uranium, beryllium rubbing on uranium and beryllium rubbing on titanium for both statically and dynamically applied loads. Normal rubbing pressures range between 1500 and 12,000 psi for statically applied loads and between 12,000 psi and 21,000 psi for dynamically applied loads. Coefficients of kinetic friction have been determined between various metals for rubbing speeds between 30 and 50 feet per second and rubbing pressures of 1600 to 3000 psi.

Stanford Research Inst. Menlo Park Calif.
FUNDAMENTAL MECHANISM OF WEAR AND FRICTION OF UNLUBRICATED METALLIC SURFACES AT HIGH SLIDING SPEEDS, by Fred M. Sauer. Rept. for Aug 55-Dec 56 on Contract N123s-60530S-4591A. Apr 57, 62p. 8 refs. NOTS 1729; NAVORD-5452.
Order from OTS $1.75 PB 131 963

An experimental program and theoretical study were conducted to gather data on high-speed wear and friction, and to determine wear mechanisms. Twenty-one test runs were made using Type 304 stainless steel sliders, and two were made using unalloyed molybdenum. Bearing pressures ranged from 160-1600 psi, and sliding velocities were 600-790 fps. It was concluded that slider surface temperature increases from ambient to melting. Molybdenum showed an over-all wear rate of 1/10 that of stainless steel under the same conditions.

METALLURGY

Ferrous Metals

Diamond Ordnance Fuze Labs., Washington, D.C.
CALCULATED MAGNETIC FIELDS IN FERRITE RODS, DISCS AND SLABS, by George R. Jones. Rev. Apr 58, 22p. 3 refs. TR-574.
Order from OTS $0.75 PB 131 938

In the design or analysis of ferrite devices, it is often necessary to know the magnitude of the magnetic field present in the ferrite. By an extension of the known method for calculating the field present in an ellipsoidal body, it is possible to make a valid approximation of the field in a rod, disk or other simple nonellipsoidal body. The approximation consists of calculation of the field relationship for an ellipsoid having major axes equal to corresponding dimensions of the nonellipsoidal body. Several plots for determining the field values in various configurations are included.

Heintz Mfg. Co., Philadelphia, Pa.
METALLURGICAL RESEARCH ON COLD EXTRUSION. Rept. no. 4 (Final) on Contract W36-034-ORD-7654, Sep 48, 114p.
Order from LC mi$6.00, ph$18.30 PB 135 708

Normalizing, quenching in water, and annealing was the best practical preparation for cold extrusion of the steels tested, because it resulted in lower hardness and provided a more uniform grain structure than existed in the steels as received from the mill. To manufacture an item by cold extrusion with high ultimate tensile strength and little loss of ductility the most suitable steels of those tested are A5120 and C1010 Aluminum Killed. Ingot Iron and C1010 Rimmed Steel have the greatest percentage increase in ultimate tensile strength when extruded. Presence of any or all of carbon, manganese, silicon and/or molybdenum tends to increase the force required in extruding.

National Advisory Committee for Aeronautics, Washington, D. C.
CUMULATIVE FATIGUE DAMAGE AT ELEVATED TEMPERATURE, by William K. Rey (U. of Alabama). Sep 58, 53p. 37 refs.
Order from NASA* NACA TN-4284

*National Aeronautics and Space Administration 1520 H Street, N.W., Washington 25, D.C.

A study of cumulative fatigue damage at elevated temperatures was conducted using heat-treated SAE 4130 alloy steel. The S-N curves at room temperature, 400°F, and 800°F were obtained from rotating-beam fatigue tests. Two-step, three-step, and five-step cumulative-damage fatigue tests were conducted on rotation-beam fatigue specimens at room temperature, 400°F, and 800°F. The results of the cumulative-damage tests are compared with those of a theoretical analysis.

Naval Research Lab., Washington, D. C.
FRACTURE STRENGTHS RELATIVE TO ONSET AND ARREST OF CRACK PROPAGATION, by G. R. Irwin, J. A. Kies and H. L. Smith. Interim rept. 20 Nov 58, 24p. 34 refs. NRL Rept. 5222.
Order from OTS $0.75 PB 151 131

The conditions of stress which control spreading of a deeply embedded tensile crack are essentially those of plane strain. If the thickness of a plate containing a through crack is small enough, crack extension is accompanied by substantial amounts of plastic thickness reduction at the leading edge of the crack. A generalized plane-stress viewpoint is then applicable, and a relatively tough shear mode of fracture occurs. Methods have been developed for duplicating both the plane-strain and plane-stress conditions in laboratory measurements of fracture strength σ_{fc}. Observations of fracture mode coupled with σ_{fc} measurements suggest that it may be possible to predict which fracture mode will occur in terms of the plate thickness, yield stress, and the value of σ_{fc} for completely plane-strain fracturing. The relationship thus outlined appears to be in agreement with the observed ductile-brittle fracture transition of low-carbon structural steel with reduction of temperature or with increase of stress loading speed. Measurements of σ_{fc}, coupled with stress analysis and estimates of starting crack size, assist the analysis of important problems, for example, fracture of pressurized-fuselage commercial jet aircraft, bursting of large steam turbine-generator rotors, structural vulnerability of combat airplanes, shattering of transparent plastic canopies, and crack propagation in rocket-engine vessels.

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
ELASTIC LIMIT OF AP SHOT STEELS AS A FUNCTION OF TEMPERING TEMPERATURE, by C. M. Carman. Oct 57, 19p. Rept. no. R-1408.
Order from LC mi$2.40, ph$3.30 PB 135 532

The elastic limit of 98V65, 4160, and manganese-molybdenum (Mn-Mo) armor piercing shot steels has been determined as a function of tempering temperature. The elastic limit of 98V65 and 4160 steels was found to rise to a maximum after tempering in the temperature range of 500° to 700°F, while the elastic limit of Mn-Mo appears to rise after tempering at 800°F.

Light Metals

Armour Research Foundation, Chicago, Ill.
DISPERSION HARDENING OF SINTERED TITANIUM ALLOYS BY REFRACTORY METAL POWDER ADDITIONS. Final rept. for 16 Nov 55-15 Nov 57 on Contract NOas-55-952C. Mar 58, 47p. 19 refs.
Order from OTS $1.25 PB 131 937

A study of powder metallurgical techniques for improving the impact properties of the Ti-36% Al alloy which has excellent strength and corrosion resistance at high temperatures. Fine particles of tungsten were mechanically blended with titanium powder to obtain hard-phase dispersions. Ti-W dispersed phase alloys showed greater strength than Ti or Ti-W alloys at temperatures up to 1200°F. These strengths are not superior to those for available Ti ternary alloys.

[Defense Metals Information Center] Battelle Memorial Inst., Columbus, Ohio.
MEMORANDUM ON THE USE OF X-RAY DIFFRACTION FOR THE STUDY OF TITANIUM AND TITANIUM ALLOYS, by J. R. Doig, Jr. Mar 58, 20p. 53 refs.
Order from OTS $0.50 PB 131 940

The first part contains suggestions on procedures to be followed to achieve optimum-quality X-ray diffraction patterns, and the second part contains information collected from the literature on standard or typical X-ray diffraction patterns. X-ray standard patterns and structure data are presented for the common titanium-rich phases. Also, tables, curves, and references are given on the lattice constants for alpha and beta solid solutions. For titanium compounds, references are given to X-ray data for the binary systems most frequently encountered.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
THERMAL STABILITY OF THE TITANIUM SHEET-ROLLING-PROGRAM ALLOYS, by E. S. Bartlett, D. N. Williams and others. Rept. on Department of Defense Titanium Sheet-rolling Program, Contract AF 18(600)1375. 25 Nov 58, [48] p. DMIC rept. 46E; AD-205 778.
Order from OTS $1.25 PB 151 061

An experimental program was conducted to evaluate the stability of the mechanical properties of heat-treated Ti-6Al-4V, Ti-4Al-3Mo-1V, and Ti-16V-2.5Al sheet alloys during thermal exposures under stress. The thermal exposures showed Ti-6Al-4V and Ti-4Al-3Mo-1V alloys to have comparable creep strengths above 600 F, considerably better than those of the Ti-16V-2.5Al alloy. Tensile test results following the exposures showed that Ti-6Al-4V exhibited a slight trend toward instability at 900 F for 1000 hours, but the degree of instability was not sufficient to warrant concern. The Ti-4Al-3Mo-1V alloy showed indication of overaging during 1000-hour exposure at 900 F, but otherwise exhibited good thermal stability. The overaged properties shown were still within the MAB target properties

for the DOP-SRP alloys. The Ti-16V-2.5Al alloy showed some instability under all exposure conditions. Tensile ductility after both exposure times at 500, 600, and 700 F, and after 100 hours at 800 F was below target, and both the yield and ultimate strength values were below target minimum after the 900 F, 1000-hour exposure. After exposure of 100 hours at 900 F, the properties of Ti-16V-2.5Al were satisfactory in reference to target, but the evidence from the other exposure conditions indicates that the alloy under this conditon are already passed through the aging peak, and is in the overaging cycle.

National Advisory Committee for Aeronautics, Washington, D.C.
INTERNAL-FRICTION STUDY OF ALUMINUM ALLOY CONTAINING 4 WEIGHT PERCENT COPPER, by B. S. Berry and A. S. Nowick (Yale U.). Aug 58, 88p. 57 refs.
Order from NASA* NACA TN-4225

A study has been made, by means of low-frequency internal-friction measurements in both torsional and flexural vibration, of aluminum alloy containing 4-weight percent of copper during aging. Both polycrystalline and single-crystal specimens exhibit an initial internal-friction peak at 173°C (for a frequency of 1 cps) after solution treatment and quenching. This peak shows all the characteristics of a Zener relaxation, including strong anisotropy. The precipitation of the phase θ' is marked by the appearance of a second peak at 135°C (for a frequency of 1cps) and by a rise in the high-temperature background internal friction. Possible causes of the second peak and the background changes are discussed.

Southwest Research Inst. San Antonio, Tex.
DETERMINATION OF MATERIALS DESIGN CRITERIA FOR 6Al-4V TITANIUM ALLOY AT ROOM AND ELEVATED TEMPERATURES, by J. K. Childs and M. M. Lemcoe. Rept. for Jan 56 to May 58 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)3348. Aug 58, 257p. 18 refs. WADC Technical rept. 58-246; AD-155 863.
Order from OTS $4.00 PB 151 274

In order to establish design criteria on the 6Al-4V titanium alloy, tensile, compressive, bearing and shear properties have been determined on both bar and sheet material at temperatures from 75 to 1000°F. In addition, tensile properties of sheet material were determined after 100-hour exposure at 600, 800 and 1000°F. Test results were compared with recently established minimum requirements for tensile strength in order to derive design values for compression, bearing, and shear. Other properties investigated include minimum bend radius for 105° bend and notched tensile strength at temperatures from 75 to 1000°F, and torsional properties at room temperature. Axial load fatigue characteristics were investigated at temperatures from 75 to 1000°F for both smooth and notched specimens at stress ratios of 0 (stress-rupture), 0.3, 1.0, and infinity. Descriptions of the test specimens, equipment, and procedures used are included. Test results are reported in tables and in curves showing the effect of temperature on the various mechanical properties. The derived design data and curves are presented in a form suitable for inclusion in ANC-5.

*National Aeronautics and Space Administraction 1520 H Street, N.W. Washington 25, D.C.

Watertown Arsenal Labs., Mass.
STRESS INDUCED MARTENSITIC TRANSFORMATION OF BETA TITANIUM, by Ralph H. Hiltz, Jr. Technical rept. on Transformation of Titanium Alloys. Oct 57, [23] p. 16 refs. Rept. no. WAL 401/276.
Order from LC mi$2.70, ph$4.80 PB 135 321

Three titanium alloys, known to provide a mechanically unstable beta structure after quenching, were selected for a study of the origin and nature of stress induced transformation. Data from hardness and tensile tests were used to study the initiation of martensite and the effect of the transformation and transformation products on the mechanical properties of beta titanium, particularly the stress-strain relationships.

Nonferrous (except light) Metals

Battelle Memorial Inst., Columbus, Ohio.
EFFECT OF METAL PURITY ON CHROMIUM-BASE ALLOYS, by D. J. Maykuth, R. I. Jaffee, and J. M. Blocher, Jr. Rept. on Metallic Materials, Contract AF 33(616)2696. Jan 56, 47p. WADC Technical rept. 56-33; AD-98 501.
Order from OTS $1.25 PB 131 999

Binary alloys over the entire range of chromium with iron, vanadium, molybdenum, tungsten, columbium, tantalum, nickel, and cobalt were prepared by arc melting, using iodide chromium of 99.99 + per cent purity, to determine the maximum chromium content commensurate with good fabricability and room-temperature ductility. Chromium-iron, chromium-nickel, and chromium-cobalt systems showed an extensive range of fabricable compositions. Oxygen, sulfur, and nitrogen, in amounts contained in commercial chromium, impart hot shortness. Use of tungsten, as a ternary addition, results in significant improvements in properties.

Illinois U., Urbana.
SELF-DIFFUSION IN SILVER DURING PLASTIC DEFORMATION IN EXTENSION AND COMPRESSION, by J. B. Darby, Jr., C. T. Tomizuka, and R. W. Balluffi. Rept. on Contract AF 18(603)106. July 58, 34p. 27 refs. AFOSR TN-58-546; AD-158 363.
Order from LC mi$3.00, ph$6.30 PB 135 573

Self-diffusion of Ag^{110} in silver single crystals subjected to simultaneous deformation at 800 and 900°C was studied using the sectioning technique.

The crystals were orientated for duplex slip and were deformed in extension and compression at constant strain rates in the range 1 to 28 x 10-5 sec-1. Total strains as large as 0.33 were attained. Recrystallization occurred in the initially single crystal specimens during diffusion-deformation under all conditions except tension at 800°C. The effect of straining on the rate of diffusion was found to be small in all cases. The straining changed the diffusivities by less than 50 percent, and it is concluded that the observed changes were probably within the experimental error. The results indicate that any increases in diffusion rate due to the generation of point defects or short circuiting paths during deformation were small. These conclusions are shown to be consistent with other experiments involving these phenomena.

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
ZIRCONIUM, by George Hall. 9 Oct 47, 53p. 39 refs. NEPA-310-IHR-E5; AD-143 436.
Order from LC mi$3.60, ph$9.30 PB 135 663

Northwestern Technological Inst., Evanston, Ill.
INTERNAL FRICTION AND YOUNG'S MODULUS OF HEXAGONAL AND CUBIC COBALT, by M. E. Fine and Evan H. Greener. Rept. on Contract AF 18(600)1468. 6 Feb 58, 9p. AFOSR TN-58-58; AD-148 099.
Order from LC mi$1.80, ph$1.80 PB 135 510

The internal friction (1/Q) of Co, as measured by an electrostatic dynamic method, increased rapidly with heating from about 250° to 560°C. The plot of log of 1/Q vs 1/T above 250°C nearly fit 2 straight lines intersecting at 400°C, the approximate hexagonal-cubic transformation temperature. The higher branch corresponds to an effective activation energy of 6500 cal/mole; the lower branch to 11,000 cal/mole. Young's modulus increased nearly linearly from 25° to 400°C with a temperature coefficient of 4.3×10^{-4}/°C. Above 400°C the coefficient is 3.6×10^{-4}/°C.

Structural Metallurgy and Corrosion

Arkansas U., Fayetteville.
METHODS OF DETERMINING SURFACE ROUGHNESS, by M. K. Testerman. Rept. on Surface and Interface Phenomena of Matter, Contract AF 33(616)2865. June 58, 42p. 19 refs. WADC Technical rept. 58-230; AD-155 828.
Order from OTS $1.25 PB 151 268

Twelve techniques for investigating the microscopic surface roughness of continuous surfaces are cited as background. (WADC TR 56-233 is a critique of known methods for measuring surface roughness.) Of these the method of capacitance measurements was chosen for experimental investigation. Measurements of permanent capacitance were made upon specimens coated with monomolecular films and were found not to be reproducible. Measurements of polarization capacitance made in aqueous electrolyte solutions were reproducible. Two methods of measuring polarization capacitance were tested, namely, the charging curve method, and the bridge method. Consistent surface roughness factors were obtained by the bridge method for copper, nickel, and steel surfaces. Investigations with formamide and acetonitrile revealed that these non-aqueous solvents were not satisfactory for polarization capacitance measurements. Experimentation was begun to establish a radioactive method for measuring surface roughness. Results were obtained that indicate this method to be better for aluminum surfaces than is the polarization capacitance method.

California U., Los Angeles.
PLASTIC DEFORMATION OF SURFACE AGGREGATES IN F. C. C. METALS, by D. Rosenthal, N. E. Friedmann and others. Rept. on Study of the Effect of Temperature and Rate of Straining on X-ray Lattice Strains in Plastically Deformed Metals, Contract AF 18(600)1022. Feb 58, 71p. 25 refs. AFOSR TR-58-48; AD-154 198.
Order from LC mi$4.50, ph$12.30 PB 135 561

From X-ray diffraction study of plastically deformed polycrystalline aggregates, a heterogeneous slip mechanism is postulated. Good qualitative agreement is obtained when these expressions are compared with the results of an X-ray diffraction study of polycrystalline aluminum alloy.

Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
INTERMITTENT STRESSING AND HEATING TESTS OF AIRCRAFT STRUCTURAL METALS, by G. J. Guarnieri. Rept. for Oct 53-Aug 54, on Materials Analysis and Evaluation Techniques, Contract AF 33(616)2226. Jan 56, 77p. WADC Technical rept. 53-24, pt. 3; AD-90 895.
Order from LC mi$4.50, ph$12.30 PB 135 127

Additional data have been gathered as part of a continuing program to evaluate the effect of intermittent load and temperature upon the high-temperature creep and rupture properties of aircraft structural alloys. The results obtained for the four alloys of 24S-T3 aluminum, RC-70 and RC-130-A titanium, and 4130 steel, further emphasize that each alloy system behaves in its own characteristic manner when subjected to intermittent temperature and load. Data of the type being accumulated are of value to design engineers in that some guidance is provided in the application of available static creep and rupture data to the construction of parts for intermittent service conditions.

National Advisory Committee for Aeronautics, Washington, D.C.
MECHANISM OF BENEFICIAL EFFECTS OF BORON AND ZIRCONIUM ON CREEP-RUPTURE PROPERTIES OF A COMPLEX HEAT-RESISTANT ALLOY, by R. F. Decker and J. W. Freeman (U. of Michigan). Aug 58, 54p. 44 refs.
Order from NASA* NACA TN-4286

*National Aeronautics and Space Administration 1520 H Street, N.W., Washington 25, D.C.

The effects of the addition of small amounts of boron and zirconium on creep properties of an alloy containing 55 percent nickel, 20 percent chromium, and 15 percent cobalt, with molybdenum, titanium, and aluminum were studied. These additions improved the creep-rupture properties at 1,600°F because of a stabilizing effect on the grain boundaries. These additions prolonged the life to fracture and allowed higher deformations before fracture. A number of optical and electron photomicrographs trace the development of microcracks and matrix changes through the creep process.

National Advisory Committee for Aeronautics, Washington, D. C.
A PHENOMENOLOGICAL THEORY FOR THE TRANSIENT CREEP OF METALS AT ELEVATED TEMPERATURES, by Elbridge Z. Stowell. Sep 58, 31p. 10 refs.
Order from NASA* NACA TN-4396

In this theory, a metal consisting of two phases, each with its own elasticity and viscosity, will exhibit transient creep after application of a constant stress. A comparison of the transient creep curves resulting from this theory with experimental data on four different metals shows that the entire family of creep curves for any one metal are given by the theory using a single set of constants appropriate to that metal.

Naval Engineering Experiment Station, Annapolis, Md.
REDUCTION OF OIL-ASH CORROSION BY USE OF ADDITIVES IN RESIDUAL FUELS, by Henry W. Schab and Frank R. Gessner, Jr. Apr 57, 55p. EES rept. 070034C.
Order from LC mi$3.60, ph$9.30 PB 137 101

The use of residual type fuels in industrial and marine type gas turbines and steam generating plants, operating at progressively higher temperatures, has presented serious corrosion problems from fuel oil-ash deposits. No metal alloys developed to date have exhibited promising long-term corrosion resistant qualities. One possible means of alleviating oil-ash corrosion is by addition of inhibitors to the fuel oils. This method is currently being investigated and preliminary results are presented in this report. Tests were conducted in small atmospheric pressure combustion rigs at temperatures ranging from 1500° to 1700°F, using a high vanadium fuel with AISI 310 alloy as standard test material. Thirty-four additives, in the form of oil soluble metal-organic compounds, were studied. Preliminary tests show that lanthanum, antimony, and iron were most promising in reducing both corrosion and depositon. Other elements showing good qualities were calcium, sodium, manganese, and the rare earths, cerium and neodymium. Tests are continuing to further evaluate the effectiveness of additional additives in forms of oil soluble compounds, dry powder, and inorganic slurries. Effects of parameters such as pressure, temperature, gas velocity, etc., are also being studied.

Rock Island Arsenal Lab., Ill.
INTERACTIONS BETWEEN FOUR VOLATILE CORROSION INHIBITORS, by Ralph L. LeMar. Dec 57, 43p. 2 refs. Rept. no. 57-2887.
Order from OTS $1.25 PB 151 010

The mutual compatibility of four VCI-on-kraft papers were evaluated in pressure contact and vapor mixtures on the basis of comparison of corrosion inhibition afforded steel panels by the single papers and their combinations.

Utah U., Salt Lake City.
HIGH VELOCITY IMPACT CRATERS IN LEAD-TIN ALLOYS, by Howard B. VanFleet, Charles R. Whited, and William S. Partridge. Technical rept. no. OSR-13 on Contract AF 18(600)1217. Jan 58, 40p. AFOSR TN-58-28; AD-148 067.
Order from LC mi$3.30, ph$7.80 PB 134 865

Impact phenomena have been investigated for the lead-tin alloys by firing 3/16" spherical pellets from an experimental gun at velocities up to 2.2 km/sec. into targets which were large compared to the resultant craters. The pellets and targets were of the same-lead-tin composition in all cases. Quantitative data for the volume, diameter, and depth, along with the mass and velocity of the impinging pellet were obtained for each crater. Correlation has been made between the crater parameters and various functions of the pellet mass and velocity for the following samples: 100% Pb; 90% Pb, 10% Sn; . . . ; 10% Pb, 90% Sn; 100% Sn.

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

Battelle Memorial Inst. [Columbus, Ohio]
INVESTIGATION OF EFFECTS OF RADIATION APPLICABLE AS GAMMA RADIATION DOSIMETERS, by J. F. Kircher, B. W. King and others. Rept. for Feb 57-Feb 58 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)3905. July 58, 101p. 119 refs. WADC Technical rept. 58-158; AD-155 727.
Order from OTS $2.50 PB 151 314

This project was initiated to survey the field of radiation effects to determine which effects might be useful for high-level gamma dosimetry. Accordingly, the approach has been to survey the literature in broad areas and then to initiate experimental studies in those cases where additional information was required for evaluation of certain systems. It was not possible, however, to carry out experimental programs with all promising systems. The areas investigated fall into four general categories: organic systems, inorganic oxidation-reduction reactions, semiconductor materials and devices, and ceramics. Several promising organic systems are evaluated. Polymer systems and dye solutions

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Washington 25, D.C.

will serve as dosimeters, but probably not to the high dosages desired. Reduction of metal oxides by hydrogen evolution from organic material holds promise but needs more study for proper evaluation. The literature on radiation effects on inorganic reactions was surveyed but no experimental work was undertaken. However, some promising systems are pointed out. A theoretical study of gamma-ray effects in semiconductor materials points up the energy dependence of this effect. It was demonstrated, however, that simple semiconductor devices can function as very high-intensity dose rate meters. Several promising glass formulations were uncovered. These are primarily antimonate glasses, with and without added polyvalent metal oxides, and high-lead glasses. These glasses show promise of being useful dosimeters to the highest dosage of interest, 10^{12} ergs/g(C).

Nuclear Engineering and Power

American Machine and Foundry Co., Alexandria, Va.
ULTRATHERMIC CAPACITORS, by Gaines W. Monk. Rept. on Improved Electronic Components, Contract AF 33(616)3605. Aug 58, 75p. 12 refs. WADC Technical rept. 57-599; AD-155 838.
Order from OTS $2.25 PB 151 256

Experimental measurements have demonstrated that four major factors determine the RC product at 500°C of most good insulators. They are: type of sample and its preparation, purity, electrode application, and the nature of the ambient gas. Three materials, MgO, Al_2O_3, and BN have been found which have RC products greater than five megohm-microfarads at 500°C. Only very pure samples of these materials have such high insulation resistances. The presence of air during a test tends to reduce the RC product of these materials by a factor of 2 to 10. Behavior of the oxides, with the exception of boron nitride, can be improved by prior baking in an oxygen atmosphere at about 800°C. The boron nitride becomes more conducting after such treatment. Irradiation of these three materials in a nuclear reactor while held at 400° resulted in no physical or electrical change in the oxides but converted the boron nitride to boron oxide. Measurements of capacitance and resistance were made on an Al_2O_3 capacitor while it was irradiated in a nuclear reactor at 500°C. The results indicated that the leakage current is increased by the nuclear radiations presumably due to gamma ray ionization. The most promising methods of fabrication appear to be the slurry dipping technique, fusing of MgO to platinum electrodes, electrolytic deposition of the oxides, and assembly of cold pressed disks and electrodes.

Armour Research Foundation, Chicago, Ill.
STUDY OF EFFECTS OF TURBULENCE PROMOTERS ON HEAT TRANSFER, by A. Shaffer and O. E. Teichmann. Rept. no. 4 for Mar 50, on Subcontract to Contract DA 36-039-sc-2004. 18 Apr 50 11p. 35 refs. NEPA 1399-ARM-33; AD-143 168.
Order from LC mi$2.40, ph$3.30 PB 135 673

Babcock and Wilcox Co., Alliance, Ohio.
EROSION AND HEAT TRANSFER WITH LIQUID METALS, Progress rept. no. 5, 16 Apr-17 May 50. 18 May 50, [11] p. Rept. no. 5205; NEPA 1423-BW-5; AD-143 428.
Order from LC mi$2.40, ph$3.30 PB 135 674

Work has continued on calibration of flowmeters to be used in heat-transfer studies with Li. The Li melt-pot charging apparatus has been completed. An electro-magnetic pump to be used in Li-erosion studies was designed and tested with Hg, and a second pump is now under construction. An isothermal erosion loop for operation with Li at 1000°F was designed and is ready for operation. Fire-extinguishing agents were tested for reaction with buring Li. An apparatus to compare the electrical resistivities of Li and stainless steel for purposes of flowmeter and pump design is now under construction. A sampling device for use in the test loop is described.

Convair, Fort Worth, Tex.
RADIATION DAMAGE TO METAL BONDED AND SANDWICH PANELS. I, by R. E. Johnson and F. Sicilio. Rept. on Contract AF 33(600)32054. 26 Nov 57, 38p. 13 refs. MR-N-163; NARF-57-53T.
Order from LC mi$3.00, ph$6.30 PB 136 815

Samples of three types of panels were irradiated in air using the Ground Test Reactor in October 1955. The three types were lap shear panels, aluminum - and fiberglass-core honeycomb panels, and corrosion-resistant steel honeycomb panels. In addition, two groups of clad aluminum lap shear panels were irradiated while immersed in various fluids. In the air-immersion irradiations, flux levels of $6 \times 10^{14} n_f vt$, $6 \times 10^{13} n_t vt$, and 5×10^{16} γ/cm^2 were attained. In the fluid-immersion irradiations, fluxes of $6 \times 10^{14} n_t vt$ and 5×10^{16} γ/cm^2 were attained. After irradiation, engineering tests were made on both irradiated and control samples. Comparisons were made of the test results of the two groups to determine the effect of radiation on the materials. Most of the panels were found to be resistant to radiation at the levels experienced. Only the following changes were noted: Lap shear panels made with Plastilock 620-626 adhesive on magnesium to 2024-T3 clad aluminum showed a decrease in shear strength. Fiberglass-core aluminum-skin honeycomb panels made with Hexcel 422-J adhesive exhibited a decrease in column creep and shear strength. Corrosion-resistant steel sandwich panels decreased in face compression strength.

Convair, Fort Worth, Tex.
REMOTE HANDLING EXPERIMENT, by P. L. Marjon and B. A. Kress. Rept. on Contract AF 33(600)32054. 15 May 57, 34p. 2 refs. MR-N-152; NARF-57-16T.
Order from LC mi$3.00, ph$6.30 PB 136 816

An exploratory experiment in the completely remote maintenance of radioactive aircraft components is described. A method of approach to the problem is established and information is presented which will enable more realistic investigations in the remote

handling art for aircraft applications. Well designed remote handling fixtures would enable more expedient maintenance of components than is possible by direct methods. A flexible arm, with adaptors for interchangeable lock-in power tools and with adequate mechanical strength, is to be preferred over the commercial master-slave manipulators. Since commercial type manipulators may require costly tools and attachments in order to perform a task, an over-all savings would be realized by developing a manipulator which is better suited to local requirements. Remote operations are greatly improved by the use of specially designed fasteners which are compatible with the capabilities of handling tools in use. Remote work is improved by provisions for close upviewing of operations. The use of binoculars, television, etc., is recommended. Important considerations in the evaluation of a manipulator are the frequency of its repair and the accessibility of its weak points.

Nuclear Reactions

Naval Ordnance Lab., White Oak, Md.
IN-FLIGHT ANNIHILATION OF POSITRONS, by S. J. Raff. Aug 57, 72p. 11 refs. NAVORD rept. 5718.
Order from LC mi$4.50, ph$12.30 PB 135 437

The cross section for in-flight annihilation of positrons with electrons at rest has been measured at 300, 175 and 100 Kev positron kinetic energy in lead and in aluminum. The method employs a beta spectrometer to focus positrons from Na22 on a foil and the annihilation is detected by the capture of both annihilation quanta in coincidence. All the measurements in aluminum, and the 300 Kev measurement in lead, agree with the theory to the accuracy of the experiment which is estimated at ± 6%. At the lower positron energies in lead, the repulsion of the positrons by the nuclear field may be expected to reduce the observed annihilation rate. The magnitude of this effect is calculated to be 18% for the annihilation of 100 Kev positrons in lead. The observed counting rate indicates that the nuclear field reduces the annihilation rate by 40% under these conditions. For the 175 Kev positrons in lead, where the nuclear field repulsion effect should be very small, the observed annihilation rate is 25% less than the calculated. These discrepancies occur in the region where the electron binding energies are comparable with the positron kinetic energy. Calculations indicate that the order of magnitude of the discrepancies is such as could be explained by taking into account the momentum of the bound electrons, the principal effect of which is to change the distribution of energy between the annihilation quanta.

Naval Research Laboratory, Washington, D.C.
BIBLIOGRAPHY OF PHOTONUCLEAR REACTIONS. SUPPLEMENT NO. 2, by M. Elaine Toms. July 57, 27p. 143 refs.
Order from LC mi$2.70, ph$4.80 PB 128 817(S-2)
See also PB-128 817(S-1), available from LC mi$2.70, ph$4.80, and PB-128 817, available from LC mi$3.90, ph$10.80.

Stanford U., Calif.
SUM RULES FOR INELASTIC ELECTRON SCATTERING, by S. D. Drell and C. L. Schwartz.. Technical rept. no. 32 on Contract AF 18(600)545. June 58, 41p. AFOSR TN-58-476; AD-158 287.
Order from LC mi$3.30, ph$7.80 PB 135 406

Radioactivity

Convair, Fort Worth, Tex.
SOLID ANGLE CALCULATIONS, by E. L. Secrest. Rept. on Contract AF 33(038)21117. 28 Apr 55, 32p. 5 refs. MR-N-77; NARF-55-12T.
Order from LC mi$3.00, ph$6.30 PB 136 818

The problem of solid angle calculations is treated in a systematic fashion for sphere and disk geometries. Rigorous expressions are developed for the solid angle subtended by a sphere at a point and by a disk at a point. Approximate expressions are also developed in such a way as to demonstrate the range of their applicability. It is felt that this compilation will prove useful in shielding applications.

Convair, Fort Worth, Tex.
RADIATION EFFECTS ON ORGANO-SILICONS, by T. W. Albrecht. Rept. on Contract AF 33(600)-32054. 25 Feb 58, 52p. 27 refs. MR-N-190; NARF-58-10T.
Order from LC mi$3.60, ph$9.30 PB 136 817

The heat, radiation, and oxidative stability of silicon materials are discussed. A study is made of the comparative stability of silicon with organic molecules through the use of electronegativity and bond strength differences of the elements and the rate of diffusion of the free radicals away from their bond rupture site. A stepwise energy reduction mechanism for oxygen is proposed that allows molecular oxygen to be changed to atomic oxygen in small 30-40 Kcal increments rather than in one big step of 96 Kcal. The mechanism helps explain the relative ease of oxidation of silicon materials and the products formed at relatively low temperatures. Theories of antioxidants as a means of protecting irradiated silicon materials are discussed briefly.

Naval Research Lab., Washington, D.C.
FALLOUT DOSAGES AT WASHINGTON, D.C., by I. H. Blifford, Jr. and H. B. Rosenstock. Interim rept. 3 Nov 58, 8p. 11 refs. NRL Rept. 4654.
Order from LC mi$1.80, ph$1.80 PB 137 037

The total infinity dosage at Washington, D.C., due to fallout of fission product debris from all atomic tests which took place between January 1951 and May 1955, has been estimated from the measured air concentration at ground level. Within order of magnitude accuracy, this dosage was found to be

about 0.2 roentgen. The Nevada tests contributed about 60 percent of this amount, and the Russian tests about 33 percent, with the remainder due to tests in the Pacific. Evidence for stratospheric holdup of activity from the thermonuclear tests of the spring of 1954 has been found. Fallout of this high altitude activity corresponds to an infinity dosage of about 0.0002 roentgen.

Walter Kidde Nuclear Labs., Inc., Garden City, N. Y.
SHIELDING CHARACTERISTICS OF AIR, SOIL, WATER, WOOD AND OTHER COMMON MATERIALS. VOL. 1: AIR SCATTERING OF GAMMA RAYS AND NEUTRONS, CHAP. 1-2, by David Spielberg. Final rept. on Contract DA 44-009-eng-2874(7). Feb 57, 152p.
Order from OTS $3.00 PB 151 164

This report presents basic data and the results of calculations relevant to the problem of reactor shielding with materials readily available at remote reactor sites. Part I is divided into three major topics, namely air-scattering of gamma rays and neutrons, gamma-ray attenuation, and neutron attenuation. Analytical discussions as well as numerical results are given. (See also PB 151 165)

Walter Kidde Nuclear Labs., Inc., Garden City, N. Y.
SHIELDING CHARACTERISTICS OF AIR, SOIL, WATER, WOOD AND OTHER COMMON MATERIALS. VOL. 2: ATTENUATION OF GAMMA RAYS AND NEUTRONS, CHAP. 3-5, by David Spielberg. Final rept. on Contract DA 44-009-eng-2874(7). Mar 57, 192p.
Order from OTS $3.00 PB 151 165

Volume 2 covers dose and heating rates for gamma-ray and neutron attenuation through infinite-slab shields. Transformation to other geometries is also considered. (See also PB 151 164)

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

Quartermaster Reasearch and Engineering Center, Natick, Mass.
STUDY OF BODY ARMOR FOR MINE CLEARANCE PERSONNEL, by Mario Di Paolo. June 58, 19p. 35 refs. Clothing Branch Series Rept. no. 4.
Order from LC mi$2.40, ph$3.30 PB 135 306

An experimental model of a mine clearance protective ensemble has been designed. This ensemble provides full body coverage and has been evaluated in a limited field test with promising results.

PHYSICS

Diamond Ordnance Fuze Labs., Washington, D.C.
FERRITE MICROWAVE DETECTOR, by D. Jaffe, J. C. Cacheris, and N. Karayianis. 1 May 57, 22p. Rept. no. TR-457; AD-131 965.
Order from LC mi$2.70, ph$4.80 PB 133 816

Experiments are described which demonstrate that the second-order effects in ferrites can be used to demodulate a microwave signal. Although the voltage outputs which were derived from the preliminary ferrite-$BaTiO_3$ systems were on the order of millivolts, the phenomena are sufficiently promising to merit further investigation. The technique is discussed of observing the magnetostriction by a ferro-electric transducer. Several factors are discussed for improving the performance of the device.

Horizons, Inc., Cleveland, Ohio.
MAGNETIC SUSCEPTIBILITIES OF PRASEODYMIUM AND TERBIUM OXIDES, by R. C. Vickery and A. Ruben. Technical rept. no. 4 on Contract AF 18(603)96. 1 May 58, 12p. AFOSR TN-58-292; AD-154 197.
Order from LC mi$2.40, ph$3.30 PB 135 263

The magnetic susceptibilities of the three oxides of praseodymium - Pr_2O_3, Pr_6O_{11}, and PrO_2 - and the three oxides of terbium - Tb_2O_3, Tb_4O_7 and Tb_6O_{11} - have been measured over a range of temperature. The magnetic moments for the praseodymium oxides are 3.55, 2.77, and 2.51 Bohr magnetons respectively, while those of the terbium oxides are 9.62, 8.70, and 8.49 Bohr magnetons respectively. These values are based on temperature-susceptibility data below 300°K and indicate adherence to the Curie-Weiss law. They are in good agreement with theoretical values for the proposed formula.

Ohio State U. Research Foundation, Columbus.
GROUP THEORY OF THE SPIN-HAMILTONIAN, by J. Korringa. Technical note 5 on Contract AF 18(600)772. Aug 57, 75p. 12 refs. AFOSR TN 57-780; AD-148 012.
Order from LC mi$4.50, ph$12.30 PB 135 238

An investigation is made to determine the possibilities of combining quantum mechanical perturbation theory and group theoretical arguments in order to develop an analytical formalism for dealing with the symmetry properties of a point in a crystal. Special attention is given to the group-theoretical problems of the spin-Hamiltonian theory. The general principles which underly the construction of invariant operators and the exclusion of unphysical ones are discussed. Some partially new mathematical techniques which include a generalization of Kramer's method for discussing the multiple splitting in free atoms or ions, are developed for carrying out this construction. A set of interaction operators, to be called the spin-Hamiltonian so as to be compatible with the symmetry of the ion in the crystal, is constructed which can be made to describe a coupling of interest to any desired degree of accuracy. Results are presented for some cases. The diagonalization of the operators is discussed briefly. The entire investigation is limited to situations in which an unperturbed system can be found for which the one-level spin-Hamiltonian is satisfactory.

Engineering Research Inst., U. of Michigan, Ann Arbor.
DETECTION OF COMPLEX AUDITORY SIGNALS IN NOISE, AND THE CRITICAL BAND CONCEPT, by David M. Green. Rept. on Contract AF 19(604)2277. Apr 58, 83p. 29 refs. Technical rept. no. 82; 2659-4-T; AFCRC TR-58-51; AD-152 566.
Order from LC mi$4.80, ph$13.80 PB 134 487

An attempt was made to use behavioral data as a basis for a mechanistic and mathematical description of the auditory frequency analysis process. The critical ban theory as proposed by Fletcher (Rev. Mod. Phys. 12:47-65, 1940) is used as an interpretive device in discussing the research in this area. Two experiments concerning the detection of complex auditory signals in noise are presented. The first experiment employed as a complex signal 2 sinusoidal stimuli. Both the duration and the frequency separation of the signal serve as variable parameters in the experiment. The complex signal is more detectable than either of the 2 stimuli which comprise the complex. A mathematical model, which is a simple extension of the critical band concept, is presented. The model is based on the assumption that the outputs of several critical bands may be combined in detecting these stimuli. The second experiment employed bandlimited white Gaussian noise as the signal to be detected. A statistical model which incorporates the extension of the critical band concept as it was used in the first experiment is presented. This new model provides excellent predictions for the results obtained in the second experiment. Both bandwidth and signal duration of these noise signals may be accounted for by this statistical model. A general model of the receiving mechanism is proposed stating that the ear may be likened to a series of bandpass filters. Filter output may be linearly combined, with weighting constants, so that an effectively larger bandpass can be obtained.

Naval Research Lab., Washington, D.C.
STRONG SHOCK WAVES IN HELIUM-HYDRODYNAMIC CALCULATIONS, by C. E. Faneuff, A. D. Anderson, and A. C. Kolb. Oct 1958, 51p. 10 refs. NRL Rept. 5200.
Order from LC mi$3.60, ph$9.30 PB 135 139

Calculations of the shock parameters for helium are carried out for temperatures between 16,000°K and 87,000°K and for ambient densities in the range 0.1 to 40 mm Hg. The effect of single ionization is taken into account preliminary to a more detailed analysis which includes the effect of double ionization, bound state excitation, and the temperature-density dependence of the partition functions. Experimental evidence for Mach numbers greater than M 100 in helium is discussed briefly.

Ohio State U. Research Foundation, Columbus.
ELECTRONIC COLLISION CROSS SECTIONS FOR NITROGEN AT EXCITATION ENERGIES FROM 10 TO 80 ELECTRON VOLTS, by Sam Silverman and E. N. Lassettre. Scientific rept. no. 8 on Contract AF 19(122)642. June 57, 42p. 13 refs. AFCRC TN-58-232; AD-152 465.
Order from LC mi$3.30, ph$7.80 PB 135 521

Collision cross sections and generalized oscillator strengths have been determined for each of thirteen transitions in nitrogen whose excitation energies lie in the interval 10 to 83 ev. Incident kinetic energy was approximately 500 volts in each case. For each peak in the nitrogen spectrum in the above range an integrated oscillator strength has been determined by integrating over the spectrum from the minimum at one side of the peak to the minimum at the other side. By extrapolating to $(\Delta P)^2 = 0$ the quantities f_0, which would equal the optical oscillator strengths if the Born approximation is valid, have been determined. Even at excitation energies as high as 80 ev the optical oscillator strengths are still not negligible. The oscillator strengths have been employed in a test of the oscillator sum rule and for calculation of refractive indices. A discrepancy has been encountered in the case of the latter quantity which is as yet unexplained.

Ohio State U. Research Foundation, Columbus.
ELECTRONIC COLLISION CROSS SECTIONS FOR OXYGEN AT EXCITATION ENERGIES ABOVE 10 VOLTS, by Sam Silverman and E. N. Lassettre. Scientific rept. no. 7 on Contract AF 19(122)642. June 57, 61p. 16 refs. AFCRC TN-58-206; AD-146 848.
Order from LC mi$3.90, ph$10.80 PB 135 520

This report has presented the results of the determination of electron collision cross sections in oxygen for energy losses up to 80 ev and scattering angles from about 3 to 10 degrees. Seven energy spectra were used for the determination of peaks. Some additional errors, not discussed in previous reports, were considered. The collision cross sections were used to calculate total collision cross sections. From these the probability of dissociation in the Schumann-Runge region was calculated. The dependence of total cross section on incident electron energy for several energy losses was also calculated. Oscillator strengths throughout the spectrum were calculated. These were compared with optical data where possible. The oscillator strengths were also used to test the oscillator sum rule and the formula for the refractive index.

Wesleyan U., Middletown, Conn.
APPARENT ABSORPTION SPECTRUM OF PHOTOLYTIC COLLOIDAL SILVER, by Eleanor V. Rosenberg, Robert M. Rosenberg, and Jose Gomez-Ibanez. Rept. on Contract AF 18(600)343. Aug 56, 8p. 7 refs. AFOSR TN-56-421; AD-96 502.
Order from LC mi$1.80, ph$1.80 PB 135 530

Optics

Air Force Missile Development Center, Holloman AFB, N. Mex.
APPARENT MOTION OF A FIXED LUMINOUS TARGET DURING SUBGRAVITY TRAJECTORIES, by Grover J. D. Schock. Feb 58, 16p. 6 refs. AFMDC TN-58-3; AD-135 009.
Order from LC mi$2.40, ph$3.30 PB 135 081

The purpose of this study was to determine the effects of linear acceleration and deceleration found in flying a ballistic trajectory on the visual perception of a target in the dark. Four subjects observed a fixed luminous target while the pilot of an F-94 Aircraft executed the ballistic trajectory. During increased forward acceleration and vertical-g force the target appeared to move downward. The reverse occured with deceleration and decreased vertical-g force values. During weightlessness the target appeared to stabilize and oscillate up and down as the subject made excursions into negative g and positive subgravity states, respectively.

Anderson Physical Lab. [Champaign, Ill.]
THE DETERMINATION OF NEAR INFRARED SPECTRA, by Scott Anderson and Raymond Isaac. Rept. for 1 May 57-30 Apr 58 on Organic and Microanalysis, Contract AF 33(616)5283. Aug 58 [31] p. 3 refs. WADC Technical Note 58-134; AD 155 773
Order from OTS $1.00 PB 151 309

Eight hundred and fifty (850) near infrared spectra of various classes of organic compounds and commercial mixtures, of interest to the Air Force Research and Development Program, were determined between the region 0.7μ to 2.8μ with the use of a Beckman DK-2 Ratio Recording Spectrophotometer. Rapid sorting of spectra was provided with the use of Wyandotte - ASTM structure and name-formula IBM cards. A method for coding near infrared absorption hands on the standard Wyandotte - ASTM card was devised. Methods of sample preparation and the use of solvents are discussed.

Physical Research Labs., Boston U., Mass.
DEVELOPMENT OF LENSES FOR ECLIPSE SPECTROGRAPHS, by G. A. Random. Final rept. for 1 July 56-30 June 57 on Contract AF 19(604)1925. 31 Dec 57, 8p. AFCRC TR-58-217; AD-146 879.
Order from LC mi$1.80, ph$1.80 PB 135 230

Solid State Physics

Air Force Cambridge Research Center, Bedford, Mass.
PROJECT PRAIRIE GRASS, A FIELD PROGRAM IN DIFFUSION. VOL. I., ed. by Morton L. Barad. July 58 [294] p. 4 refs. Geophysical Research Paper No. 29; AFCRC TR-58-235(I); AD-152 572.
Order from OTS $4.00 PB 151 425

Project Prairie Grass was a field program designed to provide experimental data on the diffusion of a tracer gas over a range of 800 meters. In each of 70 experiments the gas was released continuously for 10 minutes at a source located near ground level. The gas releases were made over a flat prairie in Nebraska under a variety of meteorological conditions during July and August of 1956. This paper includes a brief history of the project and detailed descriptions of the tracer technique and the meteorological equipment used in the field program. Tabulations of the diffusion data and the meteorological data collected during the gas releases are also presented. In addition, this paper contains data on the heat budget at the air-earth interface during other selected periods during the Summer of 1956. (See also PB 151 424.)

Air Force Cambridge Research Center, Bedford, Mass.
PROJECT PRAIRIE GRASS, A FIELD PROGRAM IN DIFFUSION. VOL. II., ed. by Morton L. Barad. July 58 [219] p. 16 refs. Geophysical Research Paper No. 59; AFCRC TR-58-235(II); AD-152 573.
Order from OTS $3.50 PB 151 424

For abstract see PB 151 425.

Brown U. Div. of Engineering, Providence, R.I.
DEFINITION OF STABLE INELASTIC MATERIAL, by D. C. Drucker. Technical rept. no. 2 on Contract Nonr-562(20). Sep 57, 24p. 13 refs.
Order from LC mi$2.70, ph$4.80 PB 135 727

The definitions given previously for work-hardening and perfect plasticity are broadened to cover viscous effects. As before, the system considered includes both the body and the time-dependent set of forces acting upon it. An external agency is supposed to apply an additional set of forces to the already loaded body. It is now postulated that the work done by the external agency on the additional displacements it produces is positive. Some of the restrictions thus imposed on permissible stress-strain relations are explored. Especial attention is paid to simple laws of creep. Uniqueness of solution also is studied.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
SCREW DISLOCATIONS AND DISCRETE ELASTIC THEORY, by Alexei A. Maradudin. (Bristol U.). Rept. on Contract AF 18(600)1015. [1956] 44p. 13 refs. Technical rept. no. 105; AFOSR TN-58-390; AD-154 299.
Order from LC mi$3.30, ph$7.80 PB 135 493

A simple model of a screw dislocation in a crystal lattice in which each atom interacts with its neighbors through Hooke's law forces is presented, and expressions for the displacement component and strain energy are obtained. Applications of the model to screw dislocations in alkali-halide crystals are discussed.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
VIBRATIONAL THERMODYNAMIC PROPERTIES OF LATTICES WITH DEFECTS. I. THE LINEAR LATTICE, by J. Mahanty, A. A. Maradudin, and

G. H. Weiss. Rept. on Contract AF 18(600)1015 and AF 18(600)1315. 1958 47p. Technical rept. no. 104; AFOSR TN-58-391; AD-154 300.
Order from LC mi$3.30, ph$7.80 PB 135 619

Several methods of analysing vibrational properties of crystal lattices with defects are developed. Integral expressions for additive functions of normal mode frequencies are derived following the work of Montroll and his collaborators. It is shown that the Helmholtz free energy can be evaluated at high and low temperatures without performing the integrations. The methods presented are valid for lattices of all dimensions, although specific results are presented here for one-dimensional monatomic and diatomic lattices. Using a method similar to that developed by Lifshitz, it is shown that the properties of a lattice with defects can be expanded in a series of powers of the concentration of defects. The coefficient of the n^{th} power depends on the properties of a lattice with no defects. Examples of such expansions are given. An exact expression for the frequency distribution function of a monatomic linear chain with an isotope defect is given.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
VIBRATIONS OF A GENERALIZED DIATOMIC LATTICE, by Alexei A. Maradudin and George H. Weiss. Rept. on Contracts AF 18(600)1315 and AF 18(600)-1015. June 58, 12p. 11 refs. Technical note no. BN-140; AFOSR TN-58-507; AD-158 318.
Order from LC mi$2.40, ph$3.30 PB 135 617

This paper contains a study of the vibrational frequency spectra of diatomic linear lattices which are more general than the diatomic lattice treated by Kelvin, and more recently by Montroll, Mazur and Potts. Some general results are given for the long wave length behavior of the frequency spectrum for periodic and disordered linear lattices.

Laboratory of Experimental Stress Analysis, Illinois Inst. of Tech., Chicago.
ON THE STRESS-OPTIC LAW UNDER IMPACT LOADING, by M. M. Frocht. Technical rept. no. 3 on Contract DA 11-022-ORD-1609. Nov 56, 21p. 10 refs. AD 114 782.
Order from LC mi$2.70, ph$4.80 PB 135 309

A study of the stress-optic law under impact conditions was made by correlating birefringence and stresses in a uniform bar fixed at one end and struck by a heavy rigid mass at the other end. The stresses were calculated by the Boussinesq solution and the birefringence was determined by streak photography. The results show that the birefringence is a linear function of the stress and the thickness. The law was further studied by correlating dynamic strains from SR-4 gages with the corresponding birefringence. This was done for two one-dimensional cases: (1) a rectangular ban under longitudinal impact as above and (2) a beam under central transverse impact. The results again show that the birefringence is a linear function of the stress and the thickness, thus corroborating the findings from the Boussinesq solution. The strain gage results also show that the birefringence is independent of the time rate of change of stress and strain during the entire period of impact. The dynamic fringe value determined from the Boussinesq solution is approximately 35% higher than the static value. The dynamic fringe value from strain measurements is essentially equal to the static value. This may indicate that the true stresses in a compression bar are approximately 75% of those given by the Boussinesq solution.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N.Y.
SURFACE STATES IN CRYSTALS, by B. A. Lippmann. Rept. on Contract DA 36-039-sc-73052. Jan 57, 16p. 3 refs. Research rept. R-545-56; PIB-473; AD-122 044.
Order from LC mi$2.40, ph$3.30 PB 135 424

A theoretical approach.

New York U. Coll. of Engineering, N.Y.
THE PHYSICAL PROPERTIES OF SEVERAL MATERIALS FOR USE IN PHOTO-THERMOELASTIC INVESTIGATIONS, by Herbert Tramposch and George Gerard. Rept. on Contract AF 18(600)1471. May 57, 26p. 3 refs. Technical rept. SM 57-5; OSR TN-57-282; AD-132 353.
Order from LC mi$2.70, ph$4.80 PB 135 600

The optical and physical properties of Paraplex P43, Castolite, and epoxy resin Hysol 6000-OP which are potentially of interest in photo-thermoelastic investigations were investigated over a temperature range from $+100^{o}$ to -60^{o}F. The techniques and equipment used to determine the thermal expansion coefficient, the material fringe value, and the modulus of elasticity as functions of temperature are described. Also evaluated were the average values of density, specific heat, thermal conductivity and diffusivity over this temperature range. Photo-thermoelastic figures of merit, which rate the optical sensitivity of materials in photo-thermoelastic applications, as well as a new method to determine this figure in a relative manner are presented.

Samuel Feltman Ammunition Labs., Picatinny Arsenal, Dover, N.J.
MECHANICALLY-INDUCED AND RADIATION-INDUCED DEFORMATION FAULTS IN SODIUM AZIDE, by Saul Krasner and David T. Keating. May 58, 45p. 12 refs. Technical rept. 2489.
Order from LC mi$3.30, ph$7.80 PB 135 093

Sodium azide crystals were subjected to mechanical force (grinding in a mortar and pestle), gamma irradiation, and reactor (pile) irradiation and were then examined by X-ray diffraction techniques to determine whether any change in the crystalline structure had occured.

Westinghouse Electric Corp., Youngwood, Pa.
RESEARCH IN PREPARATION OF HYPERPURE SINGLE CRYSTAL SILICON CARBIDE. Scientific rept.

no. 1 on Contract AF 19(604)2174. Dec 57, 45p. AFCRC TN-58-127; AD-146 841.
Order from LC mi$3.30, ph$7.80 PB 135 545

The design and operation of a high temperature (2600°C) graphite tube furnace patterned after Kroll and Lely is given. Control of the number of crystals grown and their spacing is achieved through the control of vapor pressure near small holes in the substrate and the use of seed crystals formed from evaporated strips of silicon. The periodic admission of nitrogen to the growth region produced green colored bands in crystals which clearly define the crystal boundaries at any given time.

Thermodynamics

Allied Research Associates, Inc., Boston, Mass.
THE HEATING OF SLABS WITH ARBITRARY HEAT INPUTS, by Theodore R. Goodman. Rept. on Contract AF 49(638)347. 28 May 58, 13p. 4 refs. AFOSR TN-58-524; AD-158 337.
Order from LC mi$2.40, ph$3.30 PB 135 560

The method of the heat balance integral [T. R. Goodman. The Heat Balance Integral and Its Application to Problems Involving a Change of Phase. Trans. Am. Soc. Mech. Engrs. 80:335, 1958] with a cubic profile has been applied to predict the surface temperature of slabs when the heat flux at the surface is an arbitrary function of temperature and time. The method has been extended to the case of thermally dependent transport properties. The technique always reduces the problem to the solution of a first order ordinary differential equation which can frequently be solved by quadratures. In all cases, however, the resulting ordinary differential equation is far simpler to solve than the partial differential equation of heat conduction. The method will be particularly useful when the data is given empirically, as for example, in the case of a missile trajectory when the external conditions such as speed, air temperature and air density vary with time.

Massachusetts Inst. of Tech., Cambridge.
HEAT TRANSFER AT HIGH RATES TO WATER AND STEAM, by W. H. McAdams, J. N. Addoms, and W. E. Kennel. Final technical summary rept. 18 Oct 46-30 June 48. Aug 48, 98p. 54 refs. NEPA-759-MIT-26; AD-143 431.
Order from LC mi$5.40, ph$15.30 PB 135 664

Heat transfer to water at high densities of heat flux was investigated for five different methods of heating. Each of the five programs of research required special apparatus, and yielded data hitherto unavailable in the literature. All data were taken without the use of welded-on thermocouples, and thus errors in temperature measurement due to finning were avoided.

Massachusetts Inst. of Tech., Cambridge, Mass.
HEAT TRANSFER AT HIGH RATES TO WATER BOILING UNDER PRESSURE OUTSIDE CYLINDERS, by W. H. McAdams and J. N. Addoms. Topical technical rept. Aug 48, 118p. 97 refs. NEPA 694-MIT-24; AD-143 432.
Order from LC mi$6.00, ph$18.30 PB 135 686

The object of this investigation was to find the operating conditions to give the highest density of heat flux from submerged horizontal cylinders to boiling water. A peak density of heat flux of 1,600,000 Btu/(hr)(sq ft) was obtained at a pressure of 1200 psia for the three wire diameters at Δt ranging from 22 to 27°F. The critical Δt was insensitive to wire diameter and decreased substantially linearly with increase in pressure, from 35°F at 14.7 psia to 12°F at 2500 psia.

Stanford U., Calif.
HEAT TRANSFER AND FRICTION CHARACTERISTICS OF SCREEN MATRICES AT HIGH REYNOLDS NUMBERS, by Long Sun Tong. Technical rept. no. 28 on Contract Nonr-225(23). Apr 56, 137p. 27 refs. AD-95 121.
Order from LC mi$6.90, ph$21.30 PB 135 395

The convective heat transfer and friction characteristics of six screen matrices with porosities 0.602 to 0.832 were investigated over the Reynolds number range from 500 to 100,000, based on hydraulic diameter. The present tests were performed by passing air through six large scale model matrices which had the same porosities as those of corresponding actual screen matrices. The heat transfer performance data were obtained by a transient technique using a thermal capacitor in the large scale matrix which involved the experimental determination of the temperature-time history of the thermal capacitor. The unit conductance for thermal convective heat transfer, h, was evaluated from the temperature-time history by the use of a one-lump thermal capacity transient circuit. The friction data were obtained by conventional isothermal procedures.

Wave Propagation

Antenna Lab., Calif. Inst. of Tech., Pasadena.
ON THE ATTENUATION OF GUIDED WAVES IN THE LIMIT OF HIGH FREQUENCIES, by Charles H. Papas. Technical rept. no. 15 on Contract AF 18(600)1113. 29 Mar 58, 11p. AFOSR TN-58-462; AD-158 269.
Order from LC mi$2.40, ph$3.30 PB 135 615

The conventional formulas for the attenuation of waves due to the wall losses in uniform waveguides are based on the two assumptions that the wall currents are the same as the loss-free currents and that the surface resistance of the highly conductive walls is isotropic. In the limit of high frequencies the former assumption remains valid whereas the latter assumption breaks down. In this paper new attenuation formulas are derived, which take into account the high-frequency anisotropy of the surface resistance and hence yield accurate results for all frequencies.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
THEORY OF THE MULTIPATH PROPAGATION OF FREQUENCY MODULATED WAVES, by John P. Vinti. Sep 57, 252p. 23 refs. BRL rept. no. 1025.
Order from OTS $4.00 PB 151 117

This report develops a general theory of the propagation and reception of multitone frequency-modulated electromagnetic waves which are received both directly without reflection and also indirectly after reflection from an arbitrarily located and oriented surface. The transmitting and receiving antennas are assumed to be arbitrarily oriented. They are also assumed to have properties as general as are consistent with reception of the direct ray alone. The instantaneous frequency of the receiver voltage follows faithfully the instantaneous frequency of the transmitter voltage.

Cruft Lab., Harvard U., Cambridge, Mass.
HIGH-FREQUENCY TRANSMISSION COEFFICIENT OF AN INFINITE SLIT IN A PLANE SCREEN, by S. R. Seshadri. Scientific rept. no. 17 on Contract AF 19(604)786. 20 May 58, 15p. AFCRC TN-58-161; AD-152 397.
Order from LC mi$2.40, ph$3.30 PB 135 503

The scattering of a plane wave of wave number k by an infinite slit of width 2a in a plane acoustically soft screen of zero thickness and infinite extent is considered. In the limit of large ka and for any angle of incidence other than the grazing angle, the ratio of the transmission cross section to the geometrical optical value 2a is found up to order $(ka)^{-5/2}$.

Institute of Mathematical Sciences, New York U., N.Y.
MULTIPLE SCATTERING BY A RANDOM STACK OF DIELECTRIC SLABS, by I. Kay and R. A. Silverman. Rept. on Contract AF 19(604)3495. Apr 58, 32p. Research rept. no. EM-113; AFCRC TN-58-171; AD-152 468.
Order from LC mi$3.00, ph$6.30 PB 135 400

We consider a one-dimensional reflection problem for a stack of dielectric slabs with dielectric constants which are independent samples of a Bernoulli random variable. The widths of all the slabs are the same, and each slab extends to infinity in any horizontal direction. A plane wave of unit amplitude is normally incident on the stack from below. The quantities to be calculated are the average reflected and transmitted powers. We estimate the error committed in these calculations when multiple scattering is neglected; in particular, we investigate the effect of the random nature of the scattering medium in diminishing this error. A detailed analysis of the various possible cases is given, and a number of relevant curves and tables are presented.

Ionosphere Research Lab., Pennsylvania State U., University Park.
COUPLING AND POLARIZATION COMPUTATIONS APPROXIMATED BY A SINGLE DISCONTINUITY IN THE MEDIUM, by W. Becker, A. J. Ferraro, and J. J. Gibbons. Scientific rept. no. 104 on Ionospheric Research, Contract AF 19(604)1304. 1 July 58, 39p. 14 refs. AFCRC TN-58-452; AD-152 628.
Order from LC mi$3.00, ph$6.30 PB 135 498

Following an initial suggestion by one of the authors that coupling can be approximated by considering slabs of uniform electron density around the coupling level, the problem has been further simplified by employing a step discontinuity at the N_C level. This gives a quick approximate method for computing the effect of coupling. Coupling is concentrated by appropriately deforming the N-h and ν-h curves in a region around the level of N_C; the deformation is done in such a manner that the gradient of electron density and collision frequency is zero as one approaches the level of N_C from either below or above. At this level there is, then, a step discontinuity in the N and ν profiles. W. K. B. solutions are used as the wave functions and the coupling between the ordinary and extraordinary modes is taken into account by solving a boundary value problem at the discontinuity. Formulas have been developed for the polarization of the upgoing back scattered wave and the downgoing forward scattered wave. Results are compared with those obtained by presumably more accurate methods [Parkinson (1955)]. Even near critical coupling, the approximation gives fairly satisfactory results for the polarization of the "main" echo at 150 kc/s.

Ionospher Research Lab., Pennsylvania State U., University Park.
INSTRUMENTATION FOR LONG WAVE SWEEP FREQUENCY INVESTIGATION OF THE IONOSPHERE AT VERTICAL INCIDENCE, by C. F. Sechrist, Jr. Scientific rept. no. 103 on Ionospheric Research, Contract AF 19(604)3875; Continuation of Contract AF 19(604)1304. 1 June 58, 101p. 10 refs. AFCRC TN-58-458; AD-152 641.
Order from LC mi$5.70, ph$16.80 PB 135 497

The description and operation of the instrumentation for long wave sweep frequency investigation of the ionosphere is covered. The beat frequency method of generating wide frequency sweeps is used in the 0.5 megawatt transmitter which covers the frequency range from 50 to 1,000 kc/s. Transformer coupled, push-pull, wide-band amplifiers are employed in the transmitter providing class B operation with good waveform, and obviating the need for complex tuning arrangements. The transmitting antenna used for sweep operation is a 60 kc/s folded dipole that is converted to a balanced, transmission line antenna by an automatic switching arrangement. An automatic control system is described with permits unattended, alternate operation of the 60 kc/s and long wave sweep transmitters. A sample h'-f record, obtained with the sweep equipment, is presented.

Minnesota U., Minneapolis.
ENERGY DISSIPATION IN LONGITUDINAL VIBRATION, by C. S. Chang and L. E. Goodman. Rept.

for Apr-Nov 57 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)2803. July 58, 40p. 4 refs. WADC Technical rept. 58-36; AD-155 705.
Order from OTS $1.25 PB 151 312

The problem of the longitudinal vibrations in a finite prismatic bar with a terminal viscous damper is solved. The complete boundary value problem (forced vibration with arbitrary initial conditions) is first split into two parts according to the method developed by Mindlin and Goodman. One of these parts yields the steady-state solution and the other represents a free-vibration problem, which is then solved by the method of Boussinesq. Examples of the applications of the general solutions are given and the amount of mechanical energy dissipated through the damper is computed.

Willow Run Labs., U. of Michigan, Ypsilanti.
STUDIES IN RADAR CROSS-SECTIONS, X. SCATTERING OF ELECTROMAGNETIC WAVES BY SHPERES, by H. Weil, M. L. Barasch, and T. A. Kaplan. Rept. on Contract AF 30(602)1070. July 56, 112p. 72 refs. 2255-20-T; RADC TR-57-12; AD-114 234.
Order from LC mi$6.00, ph$18.30 PB 135 540

A survey is presented of the theoretical, computational, and experimental results in literature dealing with scattering of electromagnetic energy by spheres. Various methods of derivation and related questions are discussed in detail, and theoretical support is given to the results. The calibration procedures now in use are given, and the experiments which verified the Mie theory are noted.

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

Information Theory

Burroughs Corp., Paoli, Pa.
PRELIMINARY STUDY OF AN OPTICAL PROGRAMMER, by F. H. Krantz and J. Ogle. Rept. on Contract Nonr-2145(00). Aug 57, 35p. 20 refs.
Order from LC mi$3.00, ph$6.30 PB 135 734

The study discussed in this report is one of the steps in the investigation of improved methods for fixed program storage. The study was undertaken as a result of the continuing need for higher reliability, increased storage capacity, and decreased access time.

SOCIAL SCIENCES

Air Force Personnel and Training Research Center, Lackland AFB, Tex.
ESTIMATES OF THE MALE POPULATION, 18-29 YEARS OLD BY STATES, 1960, by Jerry Walker Combs, Jr., Nov 57, 46p. AFPTRC TR-57-10; AD-146 402.
Order from LC mi $3.30, ph $7.80 PB 135 585

On the basis of the projections, about one-fourth of the States can be expected to gain or lose less than 5 per cent of their male populations, ages 18-29, during the decade 1950-1960. Gains greater than 5 per cent may be expected in 14 States, and losses greater than 5 per cent are anticipated in 20 States and the District of Columbia.

MISCELLANEOUS

Naval Research Lab., Washington, D.C.
REPORT OF NRL PROGRESS. Feb 59.
Order from OTS $1.25, $10.00/year PB 151 335

Contents:
Articles:
An improved device for making superfine plastic fibers, by K. D. Lawrence, R. T. Lucas, and J. A. Young
Survey of current levels of atmospheric radioactivity, by J. B. Lockhart, Jr.
Calculation of absorbed dose. Part I. Electromagnetic radiation, by C. H. Cheek and V. J. Linnenbom
Scientific Program:
Applications Research: Use of "artificial signals" to enhance monitoring performance
Chemistry: Infrared dispersion and determination of absorption coefficients. Variable concentration of one or all gases in mixture of five determined electrically by a signal, algebraic-summing apparatus
Mechanics: Effect of two initial loading conditions on low-temperature aging cycles of elastically shocked specimens. Absolute thermoelectric power of palladium saturated with hydrogen as function of temperature. Facilities and instrumentation of NRL Hypervelocity Laboratory. Experimental smoke generator, an adaptation of NRL pulsejet combustor, has vaporizing capacity of 90 gal/hr
Metallurgy & Ceramics: Emission spectrographic techniques for refractory metals. Effect of cold work on creep and rupture properties of metals. Temperature control during vacuum-steam degassing. Partitioning of alloying elements in malleable irons. Mechanism of corrosion of steel under conditions pertinent to steam power generation
Radio: Advancement of communication transmitter performance characteristics. Shipboard transmitter multicouplers. Meteorological phenomena and their effect upon radio transmission. Preconversion of oxide cathodes. Infrared absorption spectra of irradiated synthetic α-quartz crystals grown under four different conditions. New 100-element (10 x 10) spiral antenna scans narrow beams by rotating the elements
Solid-State Physics: Radiation effects in fused silica at low temperatures. Activated glass scintillators. Debye Θ of hexagonal crystals at absolute zero
Sound: On the theory of flexural piezoceramic circular plate sound radiators. Theory of a very thin piezoceramic hollow sphere underwater sound radiator.

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Biology and Medicine

The Tsuyatscan, by Akira Tsuya and Marshall Brucer. Oak Ridge Institute of Nuclear Studies, Inc. Oak Ridge, Tenn. Oct 1958. 32p. Order from OTS. $1.00 ORINS-24

Radioisotpes in medicine and human physiology. A selected list of references, by J. A. Mc Cormick. Technical Information Service Extension. Oak Ridge, Tenn. Aug 1958. 122p. Order from OTS. $2.75. TID-3514

Chemistry—General

Nuclear chemical research radiochemical separations and activation analysis. Progress report 7 November 1957 - October 1958, by W. W. Meinke. University of Michigan. Dept. of Chemistry, Ann Arbor, Mich. Nov 1958. Contract AT(11-1)-70. Proj. no. 7. 97p. Order from OTS. $2.25. AECU-8887

Process polarography: Some problems in the automatic determination of uranium in nitric acid, by C. E. Michelson and K. Koyama. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Apr 1956. Decl. Sep 1958. Contract W-31-109-Eng-52. 32p. Order from LC. Mi $3.00, ph $6.30. HW-42637

Preliminary investigation of isopropylated terphenyl-a potential reactor coolant, by D. R. De Halas. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Sep 1958. Contract W-31-109-Eng-52. 11p. Order from OTS. 50 cents. HW-57400

Preliminary X-ray investigations of the hydrates zirconium tetrafluoride, by R. L. Wells. Phillips Petroleum Co. Chemical Processing Plant, Atomic Energy Div., Idaho Falls, Idaho. Nov 1958. Contract AT (10-1)-205). 10p. Order from OTS. 50 cents. IDO-14455

A study of the interaction of barium metal and barium oxide with uranium dioxide, by S. C. Furman. Knolls Atomic Power Lab., Shenectady, N. Y. Jan 1957. Changed from Official Use Only Aug 1958. Contract W-31-109-Eng-52. 13p. Order from LC. Mi $1.80, ph $1.80. KAPL-1664

Plating of beryllium-copper components for electrical applications (gold and silver), by J. J. Glass and others. University of California. Los Alamos Scientific Lab., Los Alamos, N. Mex. Nov 1957. Contract W-7405-ENG-36. 53p. Order from OTS. $1.50. LA-2229

Measurement of dispersion and coalescence (disengaging) time a literature search, by Stephen Zakanycz. National Lead Co. of Ohio. Technical Div., Cincinnati, Ohio. Jul 1958. Contract AT(30-1)-1156. 22p. Order from OTS. 75 cents. NLCO-753

Magnesium sulfate chemistry and technology - a literature search, by Earl W. Mautz. National Lead Co. of Ohio. Technical Div., Cincinnati, Ohio. Jun 1958. Contract AT(30-1)-1156. 31p. Order from OTS. $1.00 NLCO-755

A castable polyurethane, by A. J. Quant. Sandia Corp. Oak Ridge, Tenn. Oct 1958. Contract AT-(29-1)-789. 11p. Order from OTS. 50 cents. SCR-54

Decontamination of the WAPD-29 loop, by R. Lloyd and W. T. Lindsay, Jr. Westinghouse Electric Corp. Bettis Plant, Pittsburgh, Pa. Sep 1957. 33p. Order from LC. Mi $3.00, ph $6.30 WAPD-CDA(AD)-48

Chemistry—Separation Processes for Plutonium and Uranium

Proposal of a new method for the separation of hydrogen and deuterium by chemical exchange between simple hydrogen compounds and palladium hydride and palladium deuteride, by Oliver N. Salmon. Knolls Atomic Power Lab. Schenectady, N. Y. Feb 1953. Decl. with deletions Feb 1957. Contract W-31-109-Eng-52. 8p. Order from LC. Mi $1.80, ph $1.80 KAPL-M-ONS-2(Del.)

Homogeneous reactor fuel reprocessing. Quarterly progress report for January 1-March 31, 1954. Job 1087. Vitro Corp. of America. New York, N. Y. Apr 1954. Decl. Mar 1957. Contract W-7405-Eng-26, subcontract 535. 21p. Order from LC. Mi $2.70, ph $4.80 KLX-1720

Throw-away fuel cycle, by J. W. Ullmann. Oak Ridge National Lab. Oak Ridge, Tenn. Mar 1957. Decl. Sep 1958. Contract W-7405-eng-26. 12p. Order from LC. Mi $2.40, ph $3.30. ORNL-2273

Controlled Thermonuclear Processes

Sherwood report--no unclassified distribution or announcement until September 13, 1958. Turbulent pitch experiments, by G. A. Sawyer and T. F. Stratton. Los Alamos Scientific Lab., Los Alamos, N. Mex. 1957? Decl. Apr 1958. Contract W-7405-eng-36. 29p. Order from LC. Mi $2.70, ph $4.80. AECD-4263

Non-linear electron oscillations in a cold plasma, by John M. Dawson. Princeton Univ. Project Matterhorn, Princeton, N. J. Aug 1958. Contract AT(30-1)-1238. 24p. Order from OTS. 75 cents. NYO-8050

Geology and Mineralogy

Mineralogy and geology of the vanadium-uranium deposit of the Rifle and Garfield mines, Garfield County, Colorado, by Theodore Botinelly and R. P. Fischer. Geological Survey. Washington, D. C. Oct 1955. 21p. Order from LC. Mi $2.70, ph $4.80. TEI-516

Health and Safety

Health protection in beryllium facilities summary of ten years of experience, by A. J. Breslin, W. B. Harris. United States Atomic Energy Commission. Health and Safety Lab., New York Operations Office, New York, N. Y. May 1958. 63p. Order from OTS. $1.75. HASL-36

Annotated bibliography of long range effects of fallout from nuclear explosions, by Allen G. Hoard. U. S. Atomic Energy Commission. New York Operations Office, New York, N. Y. Oct 1958. 30p. Order from OTS. $1.00. NYO-4753(Suppl. 3)

Instruments

A portable transistorized gamma energy analyzer, by W. G. Spear. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Mar 1958. Contract W-31-109-Eng-52. 19p. Order from LC. Mi $2.40, ph $3.30. HW-54287(Rev.)

Safety device tests in SPERT-1, by Stephen H. Fitch and Thomas H. Springer. North American Aviation, Inc. Atomics International, Canoga Park, Calif. Oct 1958. Contract AT(11-1)-GEN-8. 44p. Order from OTS. $1.50. NAA-SR-3045

Metallurgy and Ceramics

Quarterly report July, August, and September 1957. Argonne National Lab., Metallurgy Div., Lemont, Ill. Oct 1958. Contract W-21-109-eng-38. 58p. Order from OTS. $1.75. ANL-5797

Evaluation and consolidation of electrolytic thorium, by Henry A. Saller and others. Battelle Memorial Inst., Columbus, Ohio. Jun 1955. Decl. Jun 1956. Contract W-7405-eng-92. 29p. Order from LC. Mi $2.70, ph $4.80. BMI-1007

Progress relating to civilian applications during March 1958, by Russell W. Dayton and Clyde R. Tipton, Jr. Battelle Memorial Inst., Columbus, Ohio. Apr 1958. Decl. Jul 1958. Contract W-7405-eng-92. 65p. Order from OTS $2.00. BMI-1259

Progress relating to civilian applications during May 1958, by Russell W. Dayton and Clyde R. Tipton, Jr. Battelle Memorial Inst., Columbus, Ohio. Jun 1958. Contract W-7405-eng-92. 58p. Order from OTS. $2.00. BMI-1267

Progress relating to civilian applications during June 1958, by Russell W. Dayton and Clyde R. Tipton, Jr. Battelle Memorial Inst., Columbus, Ohio. Jul 1958. Decl. Aug 1958. Contract W-7405-eng-92. 51p. Order from OTS. $1.75. BMI-1273

Theoretical studies of the solidification of uranium castings, by Billie L. Fletcher and others. Battelle Memorial Inst. Columbus, Ohio. Jul 1958 Decl. Sep 1958. Contract W-7405-eng-92 48p. Order from LC. Mi $3.30, ph $7.80. BMI-1276

Niobium carbide coating of graphite tubes, by John M. Blocher, Jr. and others. Battelle Memorial Inst. Columbus, Ohio. Oct 1958. Contract W-7405-eng-92. 22p. Order from OTS. 75 cents. BMI-1296

Coating of uranium dioxide powders with metallic tungsten films, by Joseph H. Oxley and others. Battelle Memorial Inst. Columbus, Ohio. Oct 1958. Contract W-7405-eng-92. 12p. Order from OTS. 50 cents. BMI-1297

Consitiution, metallurgy, and oxidation resistance of iron-chromium-aluminum alloys, by Walston Chubb and others. Battelle Memorial Inst. Columbus, Ohio. Oct 1958. Contract W-7405-eng-92 105p. Order from OTS. $2.50. BMI-1298

The metallography of irradiated uranium-preparation, cathodic vacuum etching, and replication, by T. K. Bierlein and others. General Electric Co Hanford Atomic Products Operation, Richland Wash. May 1956. Contract W-31-109-Eng-52. 33p. Order from LC. Mi $3.00, ph $6.30. HW-42184(Rev.)

An investigation of the cracking of continuous calciners during fabrication, by W. R. Smith and W. L. Walker. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Jun 1956. Changed from Official Use Only May 1957. Project CG-613. Contract W-31-109-Eng-52. 20p. Order from LC. Mi $2.40, ph $3.30. HW-43745

The tensile properties of pure plutonium, by H. R. Gardner and J. M. Jeffers. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Aug 1958. Contract W-31-109-Eng-52. 15p. Order from OTS. 50 cents. HW-57130

Fabrication of uranium welding rod, by E. L. Brundige and others. Los Alamos Scientific Lab. Los Alamos, N. Mex. Nov 1957. Contract W-7405-eng-36. 37p. Order from LC. Mi $3.00, ph $6.30. LA-2225

Aluminum-electrocladding studies for proposed OMR fuel elements, by C. V. Alm and M. H. Binstock. North American Aviation, Inc. Atomics International, Canoga Park, Calif. Oct 1958. Contract AT(11-1)-GEN-8. 43p. Order from OTS. $1.25. NAA-SR-2704

The preparation of magnesium metal - a literature search, by Earl W. Mautz. National Lead Company of Ohio. Technical Div., Cincinnati, Ohio. Jun 1958. Contract AT(30-1)-1156. 35p. Order from OTS. $1.25. NLCO-754

The forming of complicated shapes by powder metallurgy slip casting, by Henry H. Hausner. Hausner (Henry H.). New York, N. Y. Aug 1958. Contract AT(30-1)-2131. 20p. Order from LC. Mi $2.40, ph $3.30. NYO-8665

An investigation of hot ductility of inconel and inconel X (thesis), by Edward A. Pigan. Oak Ridge National Lab. Oak Ridge, Tenn. Sep 1958. Contract W-7405-eng-26. 58p. Order from LC Mi $3.60, ph $9.30. ORNL-2571

Fundamentals of sintering--III. Third annual progress report for June 30, 1957 to June 30, 1958, by A. L. Pranatis and others. Sylvania Electric Products Inc. Sylvania Research Labs., Bayside, N. Y. Jun 1958. Contract AT(30-1) 2102. Project no. 1852. 28p. Order from OTS. $1.00. SEP-250

Pickling of the zircaloys prior to corrosion exposure, by S. Kass and others. Westinghouse Electric Corp. Bettis Plant, Pittsburgh, Pa. Sep 1958. Contract AT-11-1-GEN-14. 64p. Order from OTS. $1.75. WAPD-TM-141

Theory of stability of motion, by I. G. Malkin. Technical Information Service Extension. Oak Ridge, Tenn. N. D. Contract AT(40-1)-2274. 462p. Order from OTS. $4.75. AEC-tr-3352

Calculation of the emergency cooling performance of the SAR primary coolant system using the IBM type 650 digital computer, by R. C. Larsen. General Electric Co. Schenectady, N. Y. Jul 1956. (DF-56-AD-30). 64p. Order from LC. Mi $3.90, ph $10.80. AECU-3790

Heat transfer source file data, by M. E. Lapides and M. B. Goldstein. General Electric Co. Aircraft Nuclear Propulsion Dept. Atomic Products Div., Cincinnati, Ohio. Sep 1957. Contracts AF 33(600)-38062 and AT(11-1)-171. 66p Order from OTS $2.00. APEX-425

Shadow shields and scattered gamma radiation, by Robert E. Baker General Electric Co. Aircraft Nuclear Propulsion Dept. Atomic Products Div., Cincinnati, Ohio. Jun 1957. Contracts AF 33(038)-21102 and AT (11-1)-171. 43p. Order from OTS. $1.50. APEX-432

Technical information engineering system, by R. L. Allen and others. General Electric Co. Atomic Products Div., Aircraft Nuclear Propulsion Dept. Cincinnati, Ohio. Jul 1958. Contracts AF 33(600)-38062 and AT (11-1)-171. 18p. Order from OTS. 75 cents. APEX-435

Elastic and inelastic neutron cross sections, by Devereux L. Kavanagh and C. E. Mandeville. Curtiss-Wright Corp. Research Div., Quehanna, Pa. Jun 1958. 160p. Order from OTS. $3.00. CWR-4040

Application of the aluminum--cryolite reduction process to the plutonium recycle program, by Ward L. Lyon. Hanford Atomic Products Operation. Richland, Wash. Sep 1957. Contract W-31-109-Eng-52. 10p. Order from LC. Mi $1.80, ph $1.80. HW-52461

Couette flow at intermediate pressures, by Wendell C. DeMarcus. Union Carbide Corp. Union Carbide Nuclear Co., Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. Nov 1958. Contract W-7405-eng-26. 11p. Order from OTS. 50 cents. K-1402

Effect of temperature gradients on gas and heat transport in porus media, by Edwin N. Lassettre. Union Carbide Corp. Union Carbide Nuclear Co., Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. Nov 1958. Contract W-7405-eng-26. 8p. Order from OTS. 50 cents. K-1403

Gamma-ray absorption coefficients for elements 1 through 100 derived from the theoretical values of the National Bureau of Standards, by Ellery Storm and others. University of California. Los Alamos Scientific Lab., Los Alamos, N. Mex. Apr 1957. Contract W-7405-ENG-36. 305p. Order from OTS. $5.00. LA-2237

On the possibility of extracting energy from gravitational systems by navigating space vehicles, by Stanislaw Ulam. Los Alamos Scientific Lab. Los Alamos, N. Mex. Apr 1958. Contract W-7405-eng-36. 7p. Order from LC. Mi $1.80, ph $1.80. LAMS-2219

Notes on magneto-hydrodynamics. VII. Fluid dynamical analogies, by A. A. Bland and Harold Grad. New York Univ. Atomic Energy Commission Computing Facility, New York, N. Y. Jul 1958. Contract AT(30-1)-1480. 16p. Order from LC. Mi $2.40, ph $3.30. NYO-6486(MH-VII)

Computation of the transport coefficient using the shielded Coulomb potential, by Richard L. Liboff. New York Univ. Atomic Energy Commission Computing and Applied Mathematics Center, New York, N. Y. Jun 1958. Contract AT(30-1)-1480. 31p. Order from LC. Mi $3.00, ph $6.30. NYO-8669

Approximate solutions of steady-state neutron transport problems for slabs, by Herbert B. Keller New York Univ. Atomic Energy Commission Computing and Applied Mathematics Center, New York, N. Y. Jul 1958. Contract AT(30-1)-1480. 59p. Order from LC. Mi $3.60, ph $9.30. NYO-8671

π^--p elastic scattering and single pion production at 0.939 BEV/c (thesis), by Lee Baggett, Jr. Univ. of California. Radiation Lab., Berkeley, Calif. May 1958 Contract W-7405-eng-48. 64p. Order from LC. Mi $3.90, ph $10.80. UCRL-8302

A simple pulsed neutron source based on crossed-field trapping, by Lawrence Ruby. Univ. of California. Radiation Lab., Berkeley, Calif. Oct 1958. Contract W-7405-eng-48. 10p. Order from OTS. 50 cents. UCRL-8480

Spectrum and yield of neutrons from 31.5-Mev proton bombardment of selected isotopes of cobalt and nickel (thesis), by Hoyt A. Bostick. Univ. of California. Radiation Lab., Berkeley, Calif. Oct 1958. Contract W-7405-eng-48. 103p. Order from OTS. $2.50. UCRL-8528

The sampling estimate of the parameter variance/mean in reactor fluctuation measurements, by D. R. Harris. Westinghouse Electric Corp. Bettis Plant, Pittsburgh, Pa. Aug 1958. Contract AT-11-1-GEN-14. 21p. Order from OTS 75 cents. WAPD-TM-157

Reports to the AEC nuclear cross sections advisory group University of California Radiation Laboratory Livermore, California June 18-19, 1958, by V. L. Sailor. Associated Universities, Inc. Brookhaven National Lab., Upton, N. Y. 1958. 41p. Order from OTS. $1.25. WASH-1006

Surface motions from an underground explosion, by D. S. Carder and others. U. S. Department of Commerce. Coast and Geodetic Survey. Nov 1958. Project 26.4d. 44p. Order from OTS. $1.25. WT-1530

Radiation Effects on Materials

Estimated radiation stability of aircraft components, by C. G. Collins and others. General Electric Co. Atomic Products Div., Aircraft Nucelar Propulsion Dept., Cincinnati, Ohio. Sep 1956. Contracts AF 33(038)-21102 and AT (11-1)-171. 121p. Order from OTS. $2.75. APEX-357

Radioactive Waste

Strontium-90 concentrations in the Hanford environs, by W. B. Silker. General Electric Co. Hanford Atomic Products Operation, Analytical Labs., Chemical Research and Development Operation, Richland, Wash. May 1958. Contract W-31-109-Eng-52. 27p. Order from OTS. 75 cents. HW-55117

Reactors—General

Shielding-research area at Battelle, by Walter R. Morgan and others. Battelle Memorial Inst., Columbus, Ohio. Sep 1958. Contract W-7405-eng-92. 29p. Order from OTS. 75 cents. BMI-1291

The velocity of sound in a liquid containing gas bubbles, by H. B. Karplus. Armour Research Foundation of Illinois. Institute of Technology, Chicago, Ill. Jun 1958. Project no. A-097. Contract AF(11-1)-528. 43p. Order from OTS. $1.25. COO-248

Metal-water reactions: I. A method for analyzing a nuclear excursion in a water cooled and moderated reactor, by E. Janssen and others. General Electric Co. Atomic Power Equipment Dept., G. E. Class 1, San Jose, Calif. Oct 1958. Contract AT(04-3)-189. Project agreement no. 1. 50p. Order from OTS. $1.25. GEAP-3073

Cobalt - 60 production reactor, by D. R. deBoisblanc and others. Phillips Petroleum Co. Atomic Energy Div., Idaho Operations Office, Idaho Falls, Idaho. Oct 1957. Contract AT(10-1)-205. 99p. Order from OTS. $2.75. IDO-16421

Reactivity measurements in the ETR critical facility, by E. E. Burdick and J. W. Henscheid. Phillips Petroleum Co. Atomic Energy Div., Idaho Operations Office, Idaho Falls, Idaho. Jul 1958. Contract AT(10-1)-205. 21p. Order from OTS. 75 cents. IDO-16454

ETR core hydraulics, by R. G. Beck and others. Phillips Petroleum Co. Atomic Energy Div., Idaho Operations Office, Idaho Falls, Idaho. Sep 1958. Contract AT(10-1)-205. 27p. Order from OTS. $1.00. IDO-16464

Transient response of the ETR primary water temperature controller, by W. J. Bryon and S. R. Gossmann. Phillips Petroleum Co. Atomic Energy Div., Idaho Operations Office, Idaho Falls, Idaho. Nov 1958. Contract AT(10-1)-205. 12p. Order from OTS. 50 cents. IDO-16471

Conference report—meeting on materials for slip-on stator type mechanism motor tubes, by M. A. Golik. Westinghouse Electric Corp. Bettis Plant, Pittsburgh, Pa. Apr 1958. 11p. Addendum. 8p. Order from LC. Mi $2.40, ph $3.30. WAPD-CTA(MEE)-492 and Add.

Spherical reactor with absorbing interface, by R. R. Coveyou. Oak Ridge National Lab. Y-12 Area, Oak Ridge, Tenn. Apr 1951. Decl. with deletions Feb 1957. Contract W-7405-eng-26. 8p. Order from LC. Mi $1.80, ph $1.80. Y-F10-48(Del.)

Reactors—Power

Hazard summary report on the Argonne low power reactor (ALPR), by Abraham Smaardyk. Argonne National Lab., Reactor Engineering Div., Lemont, Ill. Oct 1957. Contract W-31-109-eng-38. 113p. Order from OTS. $2.50. ANL-5744

APPR-1 research and development program. Design analysis for flow and temperature measurement program. Task no. V, by W. M. S. Richards. Alco Products, Inc. Schenectady, N. Y. Sep 1958. Army Package Power Reactor. Contract AT(30-3)-326. 79p. Order from OTS. $2.25. APAE-37

Use of NAA facilities to obtain experimental data useful to the converter reactor, by R. Balent. North American Aviation, Inc. Downey, Calif. Feb 1952. Decl. Feb 1957. Contract AT-11-1-gen-8. 7p. Order from LC. Mi $1.80, ph $1.80. NAA-SR-Memo-228

Technical progress report. Pressurized water reactor (PWR) project for the period August 24, 1958 to October 23, 1958. Westinghouse Electric Corp. Bettis Plant, Pittsburgh, Pa. 1958. Contract AT-11-1-GEN-14. 81p. Order from OTS. $2.25. WAPD-MRP-76

Maintenance studies for an LMFR and LMFRE, by J. H. Frankfort and others. For the Babcock & Wilcox Co. Atomic Energy Div., Lynchburg, Va. Walter Kidde Nuclear Labs., Inc. Garden City, N. Y. Jan 1958. Contracts AT(30-1)-1940, subcontract AT(30-1)-1940-4, and AEJ-46. 159p. Order from OTS. $2.75. WKNL-106

Technology—Feed Materials

The recovery of magnesium and HF from magnesium fluoride - a literature search, by Earl W. Mautz. National Lead Co. of Ohio. Technical Div., Cincinnati, Ohio. May 1958. Contract AT(30-1)-1156. 25p. Order from OTS. $1.00. NLCO-747

Technology—Raw Materials

Isolation of gram quantities of ionium from Mallinckrodt raffinate, by D. F. Peppard and others. Argonne National Lab. Lemont, Ill. Apr 1952. Decl. Aug 1958. Contract W-31-109-eng-38. 58p. Order from LC. Mi $3.60, ph $9.30. ANL-4789

Wet attritioning of ores from the Colorado plateau, by Henry P. Ehrlinger, III. Univ. of Nevada. Mackay School of Mines, Reno, Nevada. Sep 1956. Contract AT(49-1)-624. 22p. Order from LC. Mi $2.70, ph $4.80. RMO-2681

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